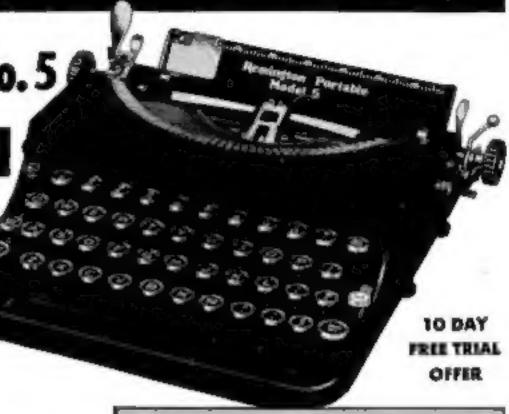


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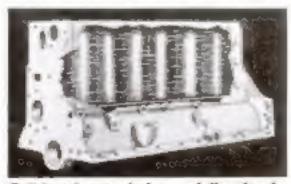


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but more, it achieved what engineers call

You'd naturally expect that this increased power would require more fuel. However, by improving the cooling system and the ignition timing, they actually cat gas and oil communicated 12% to 20%

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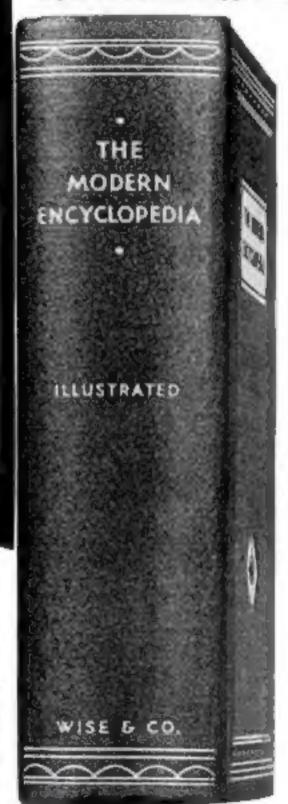
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In This Issue—Hundreds of Fascinating Articles Tell the Latest News of Laboratory Discoveries, Scientific Triumphs, and Amazing New Inventions



### THE SPIRIT OF SERVICE

THE value of a nation-wide telephone service, under one unified system, is reflected in the day-by-day efficiency of your own telephone. It is given dramatic emphasis by an emergency.

Several years ago, the worst sleet storm in telephone history swept north from Texas almost to the Great Lakes and ravaged a section 150 miles wide. Thousands of telephone poles were broken. Thousands of miles of telephone wire were snapped by the weight of clinging sleet. Telephone communication throughout the country was affected by this gap in the Middle West.

To restore the service quickly was beyond the power of the local telephone companies. Had they been forced to tackle the job alone it would have taken months and imposed a heavy financial burden. Instead, the full resources of the Bell System were thrown into the breach. From the Southwest, from New York, Pennsylvania, Ohio and the Northwest, the repair trucks started rolling into the stricken area.

Even while men were on their way, the warehouses of the Western Electric Company started shipments of tools, wire, poles, cross-arms and other needed equipment. It was only because of standardized material and standardized methods that the emergency was met and service quickly restored.

Telephone service as you know it today would be impossible without the unified Bell System.

The Western Electric Company is the manufacturing, distributing and purchasing organization for the Bell System. Centralized activity of this kind means better quality at lower cost.



BELL TELEPHONE SYSTEM

# WISE SIMONIZ







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Rusty acreese can be cleaned with a solution that will not alog openings

# Spring Repairs

FOR AILING HOUSES

By R. M. Bolen Secretary, Popular Science Institute

LTHOUGH crisp winds may still persent. March is the ideal month for starting spring repairs. Even the mildest winter takes its toll, and though you plan a fresh coat of paint or even a new roof, there are a score of other simple sprucing-up repairs that must be made to put your house back in shape.

If you were rushed last fall and simply stored your screens as quickly as possible to make room for storen windows, now is the time to go over them carefully. Screens that are torn or rapped should come in for first consideration. If the holes are not too large, they can be patched with squares of screening unraveled at the edges and interfaced into



Stains on the inner boards of the roof indicate leaks that should be fixed before the apping rains

the original neiting. Long team generally can be mended by sewing the edges together with strands of wire pulled from a strip of unused screening.

If your acreens are of the type that rust, your next job will be to brush them clean and paint them. Asphaltum varnish thinned with turpentine may be used, or regular green acreen enamel can be purchased at your neighborhood hardware store. Boiled linseed oil mixed with a little turpentine and enough lampblack to give it color also forms an even-drying coating that can be applied with a close-grained sponge instead of a brush. This mixture can be used one year and spar varnish thinned with turpentine can be applied the next.

A trip to your attic in early spring will soon show you how your roof has fared during the winter. If there are leaks, the water from melting snows will have left its mark of discoloration on the inner heards. Mark these spots carefully and make repairs from the outside, locating the spots by having your neighbor rap on the inside of the roof with a hammer. Don't be surprised if you find the faulty shingles several feet above the location of the spot.

To repair cracked wooden shingles, cut strips from a sheet of asphaltum roofing, making them long enough to reach from the butt of the shingle to the first row of shingle nails and about five inches wide. Then simply lift the shingle by prying it up carefully with a screw driver, slip the strip under it so that it is centered on the crack, and hammer the shingle back into place. The heat of the sun will melt the asphaltum enough to make it stick.

Inspect the flashings around the chimney and year pipes. Prepared cements can be purchased that will mend any leaks that may be present at these points. Also, go over your eaves troughs, Clean out the dirt and leaves that may have collected during the winter and fall and make sure that the down spouts make good connections with the drains.

In patching the cement work around your home, the secret of success lies in using good cement. The other ingredients—sand and gravel—also should be clean

and free from clay.

To repair a break in a sidewalk, such as those caused by the heaving of frosted ground, first carefully remove all of the broken pieces. Brush the surface well with a still brush to make sure that even the smallest bits of loose cement have been removed. Soak it well with water; it not only helps to remove the dirt but also prepares the surface for the new rement. If the break is smooth, roughen the surface with a cold chisel to furnish a good bond,

FOR a small job, mix the cement by adding three parts of sand to one of cement. If a large repair is being tackled, a mixture of one part cement, two parts sand, and three parts gravel should be used. Measure them carefully, and mix them well before adding just enough water to make the mixture smooth but not too wet.

If the break is at the side of the walk, place a straight board along the edge to serve as a form and fill in the hole until it is level. Finally, sprinkle a little pure cement on the wet surface and trowel it smooth. To guard against freezing, cover the repair with burlap, straw, or manure.

When the ground is soft, put an end to porous cellar walls that are continually leaking dampness. Dig a narrow ditch around your house to expose the foundation and then apply two coats of hot asphalt or coal far to the outside surface. Prepared coatings that can be applied cold also can be obtained.

An inexpensive, colories solution for damp-proofing cellar walls from the inside can be made by dissolving paraffin in kerosene, using about one and one half pounds of paraffin for every gallon of the solvent. The kerosene should be warmed carefully to about eighty degrees Fahrenbeit and the paraffin added in small bits. Naturally, extreme case must be used in both heating and applying the mixture.

VERY often, a leaky cellar wall can be traced directly to a crack. In this case, the home owner can put a Saturday afternoon to good use by chinking it with rement. Spray the crack well with water, and then stuff in a rich mixture of cement to which a small amount of lime has been added. Incidentally, bydrated lime udded in the proportions of one part to every ten of cement will tend to make any mix more waterproof.

As spring gets under way, each week will present other jobs to the home owner. Shutting down of the furnace will call for a general cleaning and whitewashing of the cellar. Milder weather will allow interiors to be painted and windows to be glazed. And the end of the May rains will offer ideal weather for painting the

outside trim.

# How a Man of 40 can RETIRE AT 60 BY INVESTING \$1.77 A DAY

STRANGELY enough, the cost of retiring on an income seems to bother some people.

It shouldn't.

If you save even as little as 18c a day, you can have a small but regular income paid you in your old age.

Or save \$1.77 a day as mentioned above, and naturally you get ten times as much income when you retire. Save more and get more.

What it costs to retire is not as important a question as how much income you want each month when you're 55 or 60 years old.

### Here's what most men went

Generally when a man gets to be around 40 years old, he knows he has only about fifteen or twenty more active years left in which to save for his old age. He knows he has about fifteen years after he reaches 60 for which he must save in advance—or accept charity.

How much does he need? \$25 a mouth for life? \$100 a mouth for life? \$250 a mouth for life?

He knows ordinary methods of saving are both slow and risky. He dare not spend his capital for fear of using it up too fast. He doesn't know how long it will last. Thus he may be facing poverty in the years he needs money most.

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2. When you retire by this Plan, you

can arrange to retire at 55, 60, or 65.

in case of your death before retirement age. (You can add this provision to your Plan if you are insurable, and also add the following:)

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# Our Readers Java Has Everything

### -Except Home Workshops!

I am living as a doctor on beautiful Java, in the rather large town of Semarang, population 250,000. We have everything here-lots of interesting medical work, and in the eve-

nings concerts, movies, clubs, and other entertainment, But-nobody is interested in a home workshop. The general belief is that the heat is too great, which it is not, as it never exceeds ninety-three degrees. I am the only amateur here who possesses a real photographic dark room, of



which I am eather proud. Populan Science MONTHLY is very much in Invor in Semarang. Il you could publish an article on glass blowing, I would be very much obliged .- P.V.O.,

Semarang, Java.

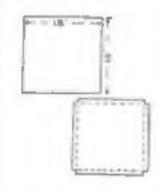
### It's a Slow Bullet but It Would Get There

IN ANSWER to the problem submitted by B. H., Georgetown, Ky., I would say that if the train were traveling at the rate of fifty miles an hour and a bullet were fired from the caboose toward the engineer's cab, and the bullet traveled at exactly fifty miles per hour, it would reach the cab. The bullet, being fired from aboard the train, is already traveling fifty miles per hour even before it is fired. When it leaves the barrel at a velocity of fifty miles per hour, that speed must be related directly to the train. The bullet will therefore be traveling at 100 miles per hour with reference to the ground and fifty miles per hour faster than the train. It will reach the engine cab in the same length of time it takes the train to progress the same distance. Perhaps, with some encouragement, B.H. will give us a real problem.—F.C., White Plains, N. Y.

### Getting the Most Out of a Piece of Tin

HERE is a sensible problem for a mathematician: I have a piece of the eighteen inches square. I want to make from this tin a water container that will hold the greatest amount of water possible. What size would the container be, in height and width? Also, what size squares would have to be cut out and

wasted? Many of your readers will be able to work this out-maybe. Some may that the height and width have nothing to do with it. They are wrong, Others say that if only one square inch is cut out of each corner, the resulting container will hold most. They, loo, are wrong. This problem is a little



more difficult than the one about the wire stretched around the earth. How many can

solve 117-H.M., Utien, Mich.

### But How Could We Make the Bugs Tune In?

IN a RECENT issue you published an article about killing insects with radio waves, and another about folling germs in decayed teeth by the same method. Why could not radio waves be utilized to kill all the insects, germs, and other pests that we have to contend with? Maybe the waves could be sent out at long range without the use of electrodes, clearing large areas of pests at one time.-T.H., Dayton, Ohio.

### Now That He Has the Boat, He Wants a Shrimp Net!

I may just completed and launched the general utility rowboat for which you pubbished plans in your August issue, and I must say that I am more than delighted with the rosults. She rides well in the water and floats as lightly as a canor. You are certainly to be congratulated on the splendid design. I have not had a chance yet to try her with a motor, but I can see from the way she handles with the oars that a light twin will make her split the water. We fish in sait water off the coast of Georgia, using live shrimp for bait, and a

shrirop casting net is almost an essential part of our equipment. How about running an article showing how to make one? They are equally good for custing for minnows. I am also interested in a small cabin cruiser, say twenty-four feet long, of shallow draft yet

seaworthy enough to



take out on fair days ten or fifteen miles to the gulf stream. I know you would find many readers interested in such a craft. It could be powered with a converted V8 Ford motor, or even with a model A, and would do eighteen to twenty-five miles an hour under favorable conditions. When you get around to it, have your designers give us plans for it - H.O.R., Atlanta, Ga.

### Microscopists, Attention! Here's an Easy One

In some stagment water I was examining under the microscope, I saw a long, transparent, wormlike creature that was blunt on one end and tapered down to a fine point at the other. It had organs running from the interior end to a point undway of the tail, I worder if some reader could help me out in identifying the creature.-W.C.M., Peoria, Ill.

### This Sounds Like a Corking Good Idea

HERE'S & hint for the amateur chemist whose cork stoppers are caten away by lye; Take a cork that fits the bottle and make a plaster mold with it. Fill the mold with melted lead, and when it is cool file the lead stopper smooth. This stopper will resut the action of lye. How about plans for a incrotome fitted

with an old raror blade, and instructions for using it?-L.J.L., Philadelphia, Pa-

### Some Competition for the Weather Man

I near your recent article on "Making a Wind Gauge" (P.S.M., Jan. '35, p. 64) with great interest. I have

been thinking for some time of setting up a home weather bureau, and this gives me my first opportunity to get started up it. It seems to me that with a little practice we amateurs ought to be able to hit a better average than the prufessionals who guess for the newspapers. I



hope you will publish more information on weather, describing such instruments as a recording thermometer, mercury barometer, hygrometer, and seismograph. I would also appreciate suggestions as to any instruments I will need to buy, and where they can be purchased.—H.S., St. Louis, Mo.

This is to express our appreciation of the article on the homemade anemometer, in the January issue. In our work of gliding and soaring, the weather plays a highly important part. We recently found that an anemometer was a necessity, and were about to go to work to design one for ourselves. Your instrument just fills the bill.-Intercourse Glider Club, Intercourse, Pa.

### Try to Thrill a Microscopist With a Racing Carl

I Ackes with Mile M.D.M., of St. Augustine, Fla. Why not put in more articles on machines? Chemistry and microscopy are very lateresting subjects, but they don't give you the thrill of seeing your first engine run or driving your homemade car. Why not give us some dope on racing cars? I've been fooling around with one and have had a lot of fun,-R.S., Hanover, N. H.

### A Britisher Must Have His Umbrella, Even et a Fire

A RECENT ISSUE OF POPULAR SCIENCE MONTHLY showed London fremen using as-

bestos suits and umbrellas for protection against sparks and brands, Having once held the business end of a fire hose (while the regular fireman picked himself up off the ground), I have grave doubts of the practical value of the umbrellas. Wrestling with a hose with pressure around a hundred



pounds, a fireman has neither time nor arms to spare for holding an umbrella. London bremen can have their asbestos umbrellas;

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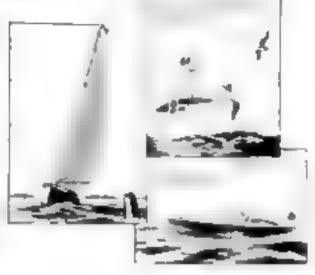
Letter No. 2. After receipt of these rules, write us in your own words why Valspar Marine Paints and Varnishes are best for your boat. Send this to us not later than June 1st.

By July 10th the awards will be made. They will be shipped as soon as possible thereafter. Names of winners will be announced in the August numbers of the yachting magazines.

### Remember-

- To compete you must own a bost any boat from a rowboat up will do
- To qualify you must send in the entry blank with all questions answered.
- To have your entry considered for the awards you must conform to the rules which will be mailed to you,

Good luck to you!



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- 10. Who specifies the make of paint and varioth on your boat
- it. What is her color scheme?

Cabia, menade

Cabin, inside

H 1

Bottom

Deck and cahes top

12. If you should win first award which of the models would be most interesting to you? If you will tell us we will ask the manufacturer to send you full information. give me a high pressure hose Of course asbestos suits have long been used for rescue work in the navies of the world.—P to D Chicago, Ill.

### One Good Problem Just Leads to Another

Looks like the boys in Our Readers Say are going in for some heavy mathematics. More power to them—and please print some

more problems. We can take it. I'll help the work along with the following. A frustiam of a cone has a signt height of twenty-four inches and upper diameter of six inches. What should be the diameter of the base to give maximum volume to the frustiam? Throughout the depression I have al-



ways managed to scrape up enough money to buy Popular Science Monthly I just couldn't mes Our Readers Say with its interciting problems...F.L.M., Aurota, El

### Knowing What To Invent Is the Inventor's Business

Titane's just one thing wrong with the suggestion of VE H., Los Angeles, Calif., that you start a "What To Invent" department Knowing what to invent is what inventors really get paid for, once the need is seen, almost anybody can figure out how to meet it. For example, I had long been britisted by the paper wrappers you find on lumps of seast in some restaurants. To peel off the wrapper, you had to get your finger has under the everybody also had experienced the same inconvenience, but nobody did anything about it, apparently accepting it as one of the firetoting things in life. Then suddenly, one day in my favorite restaurant, I ducovered that the weappers had changed. There was a prolecting tab on the overlapping edge, making it an easy matter to grasp it and tear it off Simple, wasn't it? Somebody had just used his mondie. But the real work was in seeing that something could be done about the mat-ter If anybody had thought to list this in a What To Invent" column, he could have gone on himself and worked it out. The best thing for the would-be inventor to do is to cu tivate the mental habit of always asking himself, "Isn't there a better way to do thin?"
--D Ma New York City.

### Regardless of Physics, It's Bad Table Manners

I make a problem which has proved a hard one for both me and my dad. Any physicist will tell you that when you put a cork loosely in the neck of a bottle and then exhaust the air from the bottle, it is the pressure of the air on the outside, and not the soction on the taside, that pushes the cork in. But how does this principle apply when you suck up a string of spaghetti more than mouth? It doesn't seem possible that the pressure on the

outside could push it in. If the pressure were exerted on the end of the string it would crumple up If he spraghet were pushed on the side, it wouldn't be pushed on both side and end, becauselt a hunging limp. So how come? I wish somebody would give me a lift on this prob-



lem, for the sake of my peace of sand.— J L.P., Geneva, Switterland.

### A Reader Rallies to the Defense of Darwin

I would like to say this much in defense of Darwin's theory against the attack of L S.B., of Fullerton, Calif. In the first place I tannot see where he offers my substantial arnument against Darwin's theory Darwin's theory deas with life and not with the materral of which life is composed. Chemistry, as well as physics, is a study of natural laws, and a study of how man may use them to his own advantage. Water is a natural compound because the valence of oxygen is two and the valence of hydrogen is one Thus water is remposed of two volumes of hydrogen to one volume of oxygen. Valence is a natural law that states whether or not two elements will combine, and if they will combine, in what proportions. Because of this, water is the same today as it was millions of years ago when the earth was a main of molten rock being torn from the sun by a passing celestial body Suppose that these natural laws did not hold true. Water might one day be hydrogen peroxide, and the next day it might suddenly turn into its respective gases and disappear into the atmosphere. Darwin said that over long periods of time animals and plants either developed or degenerated according to their covironment and the amount of competition each encountered to its life. He also said that organs were developed according to whether

or not thes were needed in the manner the litards who had developed a dring for jumping through the air either while playing or while hunting, found through the course of ages that their scales were gradually turning to feathers. I have said shows that chemos ry and ex shows that



tion can in may be connected with each other. The existence of the annual and point of that we have today is entress dependent upon the stability of the laws of nature.—
F.H., Fort Wayne, Ind.

### There's No Frustrating Thu Math Shark

Tuosa problems in mathematics handed out by E. A., Sault Sainte Mane, Mich., were A-1 muscle builders in pencil-pushing. I refer to the "helix on a frustum of a cone" and the physics problem in heat absorption. On the helix. I finade obtained a formisia for accurate resurs only after integrating the pular coordinate formula for length of an art of any curve. Ms answer turned out to be 2 5 00 inches for the sength of helps. The dat development of the surface shows a lune of lie storal family. In the physics problem of the stret cube praced in the hot oven the fact that the flow of heat into the cabe sown up consumments as the difference in temperature between oven and rube approaches remeans that the cube never does reach the exact temperature of the oven, the time is infinity, theoretically.-W.H., Detroit, Mich.

### Inventor Finds the Answer to a Housewife's Prayer

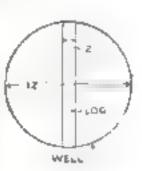
The Tesas housew fe who put the inventors on the spot in Our Readers has received a non-dropposite cout backer well, I have the cout hanger that she and many other housewives have been looking if a After repeating the daily exercise of picking up roat hangers for years. I devised a book that will stay on the pose, rod or clothesline. It does not require any extra clamps or springs in the past year I made several of them for people in the neighborhood and they say the device works fine. I am now arranging to

have it manufactured and marketed.—J P D., Milwaukee, Wis.

### It Might Be Easier To Dig Somewhere Else

I HAVE been afraid for some time that some math bug would send in the problem about the horse in the circular field and that I would

not have the wind power to have it alone. The solution involves chicu as cand of course analytical periodic transfers, and architectural reason I do not believe that a decaded solution here is practical. A lens high two feet for the rope will give an area that is



correct to about four tenths of one percent. Since the solution of the equation obtained by integrating is a cut-and-try, or "Newton's method" solution, I left it at 180 feet rather than carry it further. Now I'll ask one A man thes a well twelve feet in diameter and a doing so finds a log two feet in diameter lying directly across the center of the bole. What is the volume of the section of the log that he has to cut out in order to dig the well through it, and complete the job?—

J J T., Shadyade, Ohio

### More Kind Words for the Vapor Buggy

I saw the request of F.H., Lincoln, Kaus, for an arrate in sceam liven as arranges I have been wondering a lot myself about why they are not being used now, and would like to see an acticle on them. To my mind, the great handicap of the steam automobile is the difficulty of general ng steam in a mobile unit. The steam angine is really simpler and requires less parts than an international internation ongine.—L.C., Memphia, Tenn,

Like F.H., I am a steam automobile enthusise. I know from expensive of the advantages of this form of power for automobiles, having formerly owned a car of this type—F.R.V., Baltimore, Md.

### And California le Still To Be Heard From

Let G.S.L., of Newcastle, Australia, who boosts of fifteen days of fine weather, meditate upon this At a Civilian Conservation Corps camp here at Tucson, where outdoor work is done exclusively, they lost only three hours of work all last winter (from Semember to June) on account of bad weather—G.H.R., Tucson, Arix

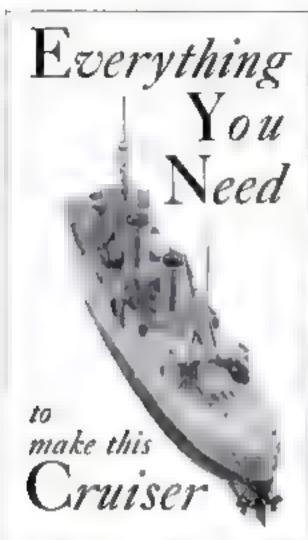
### A Late Flare-up of the Christman Spirit

Mayor some of your readers can explain the While experimenting with a Ford spark coil, I connected up a burned-out Christmas-

tree bulb to the netondary terminals. The filament in the bulb was perfect except for a small break about one fortieth of an inchwide. Of course this rendered the bulb inoperative. When I switched on the current the bulb moved with a weigh blue light. This clow extended from the base.



of the frament to the place where the break was. Is this due to some kind of mas inside the bulb? If not, what caused it?—J.R.B., Windsor, Conn.



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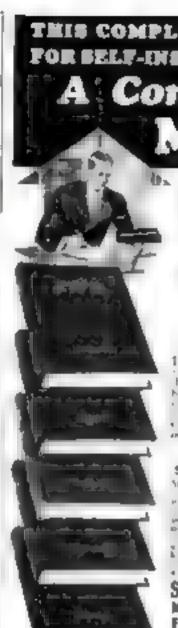
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### **MATHEMATICS FOR SELF-STUDY**

By J. E. Thompson, B.S., A.M., Dopt. of Mathematics, Fratt Instituty

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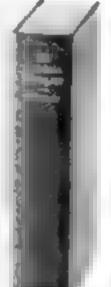
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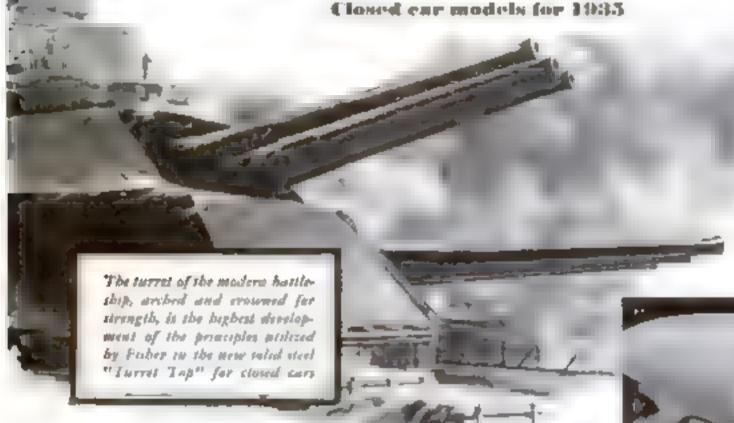
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We regard it as the greatest advance in motor car safety in a decade—and one of the greatest advances in smartness also.

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lation is as important as ever and you will find full streamlining, more luggage room, windstream V-type

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windshield, wider sexus, more headroom, bigger doors as well.

But the most vital advance of all is the new solid steel "Turret Top" -introduced on the new Chevrolets (Master De Luite Series), Pontiacs and Oldsmobiles - and found, like

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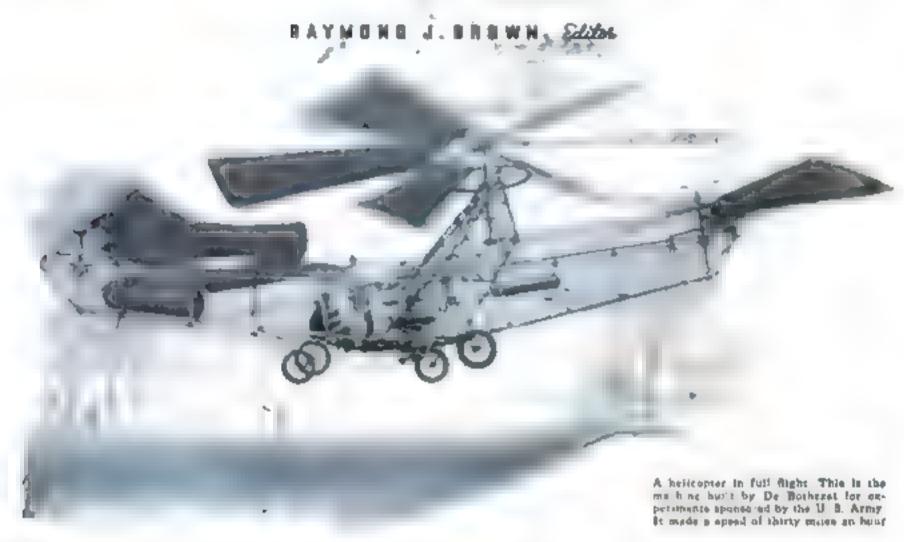
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### POPULAR SCIENCE Monthly

**MARCH 1935** 

VOL. 126 No. 3



# Planes That Go Straight Up

OPEN NEW FIELDS FOR AVIATION

NONG the skystrapers of lower New York City a few weeks ago a strange weigless craft dritted down to a vertical landing. Its wheels touched the concrete of a pier and rolled less than a dozen feet. With balancing wings eliminated, it represented the latest style in autogiros. The flying windmall has taken another step toward the goal of a thousand inventors, the belicopter

An autogiro can descend vertical v but it can take off only after a run. A beiscopter could get out of a field the sue of its landing gear. It could climb straight into the sky, could bover like a humaning bird, and could drop like an elevator descending its shalt. Entirely new reasons of serial travel await the perfection of such a cruft.

Military observers could dort into the sky, sidestep diving pursuit planes, and plange to a landing, private ships could be housed in rooftop hangars shaped like water towers, office buildings could be capped with honeycomb cells holding the



A wingless estogics photographed on a pier at the foot of Wall Street, New York City, where it leaded after a light from Philadelphia. It later took off from the turns aport



This strange contraption is a helicopter taberatory on wheels, used at the Institute of Acceptations on St. Cyr, near Patis. Prance, to study the problems involved in vertical Sying

helicopters of the workers, each craft dropping into its compartment in the morning and rung straight up from it at night, actual shuttle lines could link centers of population with airports and suburbs. These are not fantastic visions. They lie entirely within the realm of possibility. And it is such possibilities that spur on the inventors of many lands.

As these words are being written a cable from England tells of dramatic progress. Mechanics at the fumous Brackburn airpians works are busy assembling a huge craft of revolutionary design. Invented by Oskar Asboth, former director of a government research laboratory in Austria, it is designed to climb vertically to 10,000 feet and to attain a cruising speed of 110 miles an hour

A single-seated experimental model of similar design is said to have made 200 flights without a mishap. Secret tests were carried out by Capt. R. N. Laptrop, a technical official of the British Air Ministry.

He reports the slup climbed straight into the air at a surprising rate that it maneuvered under pertect control, hovered over one spot, and landed gently at the end of each flight. On neveral occasions, he soared over the trial field with his hands off the controls. A mechanic, who had never paloted an airplane in his life, is reported to have taken the new craft up without the least defficulty.

All over the world, aerobautical experts are eagerly awaiting the tests of the new machine now nearing campletion. Twin, motor-driven screws. cutting through the air in opposite directions. will lift the craft while a third propeller pulls it lorward. This propeller is thrown in and out of gear by a clutch in the cockpit. Because the machine descends vertically, landing wheels are unneeded and the curi-

ous akycraft comes to rest upon four inflated pads which act as shock absorbers. In the event of engine failure, a soil spinning feature of the variable-pitch fitting screws as said to prevent a fall. Speed and load tests will soon reveal how far the new machines goes in rivaling the ability of orthodox planes. A second behoopter of like design is reported under construction in Austria.

To the average person, that item meant little. Political news crowded it from the front page. But to those who recall the long trail inventors have followed, searching for the goal of vertical flight, it was a thrilling story.

For five centuries, since the days of Leonardo da Vinci, the geneus of the Renaissance, men have been striving by means of a host of mechanisms to lift themselves vertically into the sky with heavier-than-air machines.

It was a toy belicopter that first interested the Wright Brothers in aviation; it was the helicopter that Thomas A. Edison maintained throughout his life would be the ultimate craft of the sky; and it was the helicopter that such men as Peter Cooper Hewitt, inventor of the mercury are lamp, Louis Brennan, inventor of the Brennan torpedo, Emile Berliner, father of the microphone, Edison, and others, spent years trying to perfect.

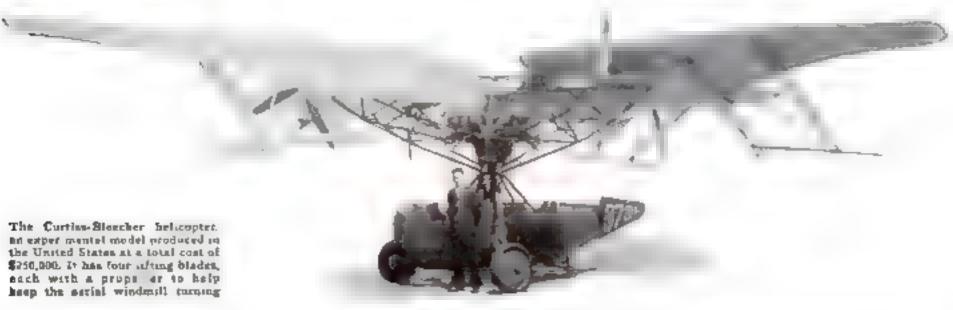
Among the papers left by Da Vinci at the time of his death in 1519, was the drawing of a proposed serial craft which was to be lifted by "a great screw turning on a vertical axis." Three centuries later, a Frenchman, named Pauceton, designed a mathine for navigating the sur It was to have "two turning mills, one to support the apparatus, the other to drive it along. A few years afterwards, Launoy and Bienvenu, fellow-countrymen of his, exhibited a flying toy Two screws, formed by four feathers and turned in opposite directions by rubber hands, carried it aloft.

In place of rubber bands, Enrice Forlantal, an Italian, used a midget steam engine which he designed about the time of the Civil War, His model helicopter, driven by its putting power plant actually rose from the ground and flew. But his design was never translated into a full-sized machine,

The gap between the model and the mancarrying craft is tremendous. Hundreds of patents have been granted to inventors for heiroptem that appeared sound on paper. Models have pulled aloft weights that, increased proportionately for big machines, would have equalled 100 pounds lift per horsepower. But the complicated mass of tubing and guywires, engine braces and transmission shafts, balancing flaps and propeller braces, have piled up the weight and increased the danger of breakdown in the big machines.

EARLY innovators like Edison and Emile Berliner were handicapped by heavy engines. Edison's weighed almost his pounds per horsepower If he said, motors could be built weighing only three or four pounds per horsepower, vertical hight would be simple. Today, we have air cooled aircraft engines that develop a horsepower for every pound and a half of weight.

By 1907 motors had been improved greatly and that year stands as a landmark in belicopter history. In France, two machines carried their proits into the air One was designed by Paul Cornu, the other by Louis Brezuet, later famous as a designer and builder of airplanes. It was one of his



ships that, in 1930, carried Capt. Disudonne Coste and Maurice Bellonte 4,030 miles on the first westward transatlantic flight linking Paris and New York.

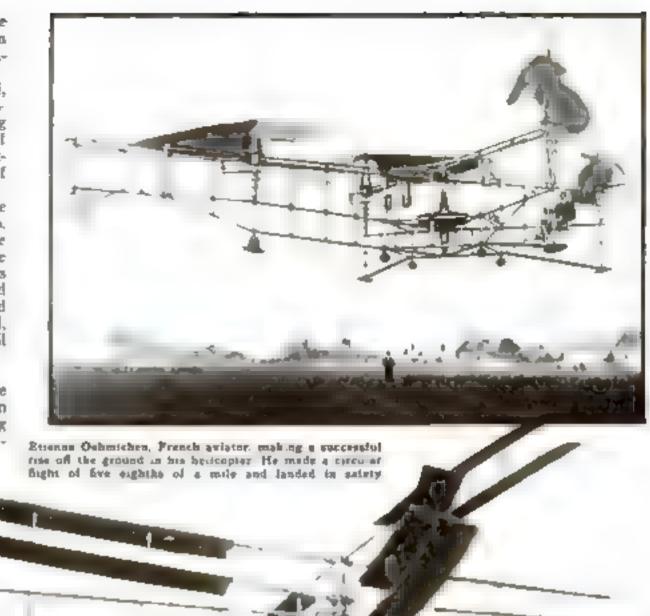
Cornu's marhine had cloth-covered, paddle-shaped blades. The power was transmitted to them by leather belts running from the engine. This fact, during one of the early trials, gave the inventor an exciting few minutes. Only the quick wit of his brother saved him from disaster

As the craft nosed from the ground, the belt to the rear lifting blades began to slip. The blades slowed down. The front of the machine reared higher and higher into the nir. A moment later the whole apparatus would have trashed over in a backward somersault had not Comu's brother leaped up, caught the forward framework and, daugling from it, restored balance until the machine could settle to a landing.

FOUR biplane blades lifted the huge machine constructed by Breguet. On August 24, 1907, with the motor volleying like a machine gun and the blades thresh-

ing the air, the awkward craft lifted its inventors several feet from the ground, then dropped back to earth.

About this time, inventors all over Europe were Unkering with helicopters. One was a young Russian, now world-famous as a designer of huge multi-motored flying boats. In 1908, Igar Sikorsky i nished a machine near Moscow It had a fifteen horsepower engine and twin lifting propellers whirling







Above the Marquis de Percara rides a helicopyra into the air at Barcelona. Spain the later set a world a record with a flight of he if a mile in this much he Left, one of the early experimental helicopters of Emile Berliner. This mechan lifted its own weight

on a concentric shaft. The engine was too weak. At the trial, the machine busied like an infuriated bumblebee, but hugged the ground.

Undiscouraged, young Sikorsky persuaded his father, a professor of psychology at Moscow, to venture more rubles on a second machine. It had a stronger motor and on several occasions rose into the air carrying ballast instead of a pilot. Controlling it by long strings, young Sikorsky ran alongside as the helicopter made flealike hops over a level field. Shortly afterwards, he turned his attention to airplanes and these early adventures with helicopters are little known.

The World War saw a curious adaptation of the helicopter idea, a "flying tin can" which carried observers aloft over the Austrian trenches. Three motors, reënforcing each other, delivered power to twin lifting screws. Above the framework was a cylindrical turret, suggesting a fin can, which housed the observers. The whole craft was operated like a captive balloon, rising at the end of a cable and being pulled down from the sky by means of a winch. Known after its designers as the Petrocay-Karman helicopter, it rose on a number of occasions to beights of a hundred feet and more.

HOWEVER the men who rode it never attempted to bring it to earth by throttle control. They always let the cable pull them back to earth. Thus, the machine contributed little to one of the biggest problems of the helicopter, the problem of landing safely, especially if the engine fails.

As a matter of fact, designers have found it easy to get off the ground. The hard suts to crack have been maintaining balance in the air and descending safely.

To keep on a level keel, some machines have had the opposing propellers filted toward each other Others have had the whole mart upon which the air screws revolved designed so it could be tilled in any direction. Still others have had small auxiliary blades spinning at the far corners of the apparatus to lift or depress as the pilot wished. Variable-pitch lifting screws, which can be changed to regulate the "bite" they take out of the air, and consequently their lift, form a fourth solution which has been advanced by innovators. Nearly adthe helicopters which have been produced have had the engines and pilots placed low to provide a pendulum effect that would aid in maintaining balance in the air

So far, no beharopter has flown on a gusty day and no belicopter has landed safely from any beight with its engine dead. Unless the machine can (Continued on page 116)



# for FISH for SAVE salmon canning industry

The construction of the fish locks in made clear by this diagram. They opera a on the same principle as navigation locks.

HEN the Federal Covernment recently decided to build a seventy-two-foot power and navigat on dam near the mouth of the Columbia River at Bonneville, Ore., the members of the commercial fishing and fish canning industries had a few questions to ask

"What is the government going to do about the salmon run?" they demanded. "Don't they know that every one of the many millions of salmon that enter the Columbia River each year will have to get over that dam to reach their spawning grounds, or there won't be any Columbia River salmon it lastry in a very few years?

"That annual run of salmon is worth anywhere from five in I ion to ten indian donars. Twenty thousand people are dependent on it, directly or indirectly, for their living. And it won't be only the salmon canning industry of Oregon and Washington that your dam will run. It will ruin salmon fishing all along the Pacific Coast, because the Columbia River is by far the most important spawning stream for the Chinook salmon caught by troilers at the way from Juneau to Monterey. If they can show us how they are going to make those millious of migrating

salmon hop over that sevenly-two-foot dam, we'll start obsering for their Bonneville project."

The government engineers passed along the job of "showing the hisbing industry to the scientists of the United States Bureau of Fisheries

Those scientists do not as yet know all about the several varieties of salmon that are important commercially in the waters of A aska and of the Pacific Coast States, but they have been studying them for a good many years, and they have found out enough about their life cycles and their habits to be able to forecast the catches of future seasons with astonishing accuracy. For example, they predicted that 1934 would be a big year, and last summer the salmon came into the rivers in such numbers that Alaska canners packed 400,000 more cases of fish than they did in any other year on record.

They know that young salmon stay in fresh water for one or two years, and then go down to the sea. They know that two, three, or four years later—usually two

By Arthur Grahame years later—those that have escaped the penis of deep-ses life return to their home rivers to spawn and then to die.

After spending several days lost summer watching fremendous numbers of these fish fighting their way up shallow and rocky tributaries to reach their spawning grounds, Elmer Higgins, chief of the Bureau's division of Scientific Inquery, remarked that this migration of sulmon was the most impressive demonstration of the biological urge that he had ever observed. Homeward-bound sa more will fight to the last samee of their rapidly dimunshing strength—they cease feeding when they bead for their last roundup, and live on their stored energy—to reach their spawning places. They will battle gal-lantly against the swiftest currents. They will leap out of the water to get over low falls that bar their way. But they tan't leap over a seventy-two-foot dam!

After studying the problem carefully the Bureau's scientists presented their solution. They would provide a ladder up the face of the dam for the salmon to tamb. And if the fish didn't take to the job of clambing the ladder, they would take them to the top of the dam in elevators'

Fish ladders have been hult and operated successfully in the past, but never one of even one twentieth the size of the giant fishway that will take the great Columbia River salmon run safely over Bonneville Dam.

As you will see in the accompanying drawing, at Bonneville the Columbia River is split into two channels by Bradford Island. On the south shore there will be a navigation canal and locks, and a sixanit power dam will span the south channel. Across the north channel will be built the seventy-two-foot spiloway dam-a lowcrested structure with eighteen gates that can be raised above water level, leaving ande obstruction to the river's flow at the time of the tremendous spring freshets for which the Columbia is famous.

Harlan B. Holmes, associate aquatic bi-0.0gist of the Bureau, was placed in charge of designing the fishways, in cooperation

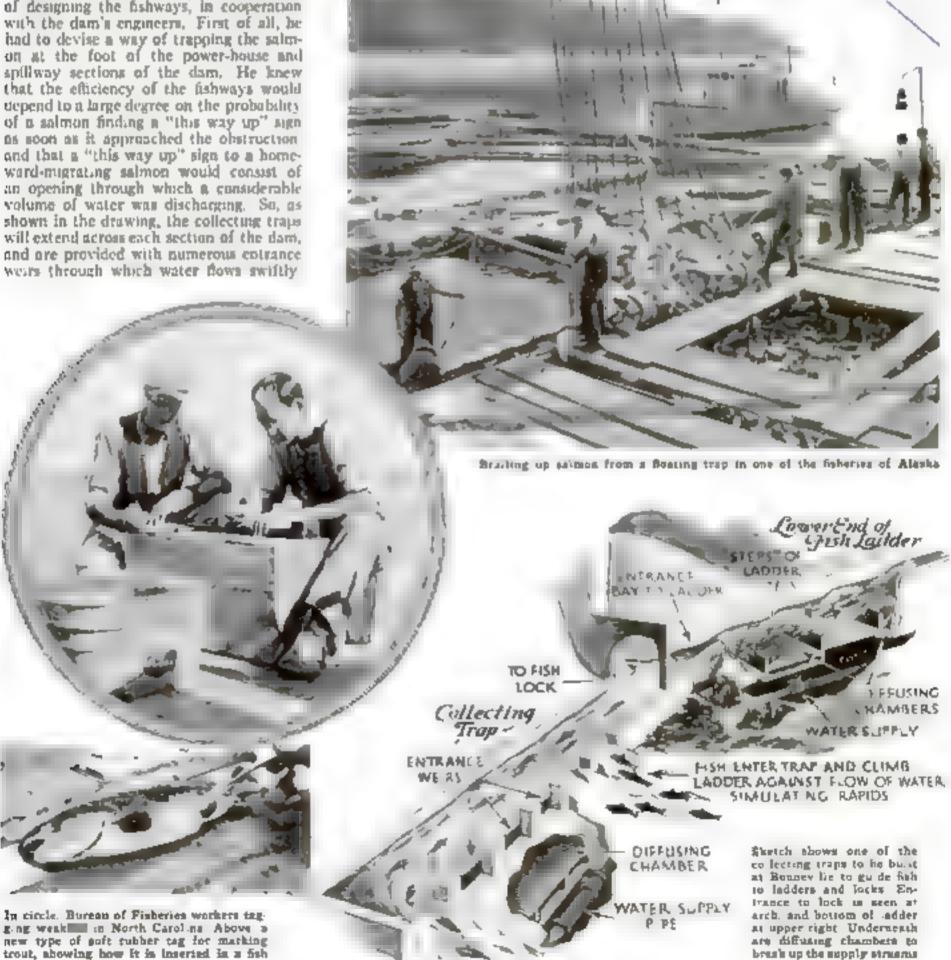
When the fish were trapped, they would have to be induced to climb the ladders provided for them. To do this, conditions would have to simulate the natural conditions that salmon face in ascending rapids—a series of pools, with swiftly dowing water connecting them. The concrete fish ladders shown in the drawing solved this problem. The water in the pools formed by the various chambers will vary from five feet to ten feet in depth. The column of water flowing down the ladders always will be of sufficient depth to allow the fish to swam through it, so they will not have to jump a series of falls.

Ladder Number One leads over Bradford Island from the south end of the spallway trap, and on the asland joins Ladder Number Two, which leads from the north end of the power-bouse trap. After joining they discharge into the pool above the power

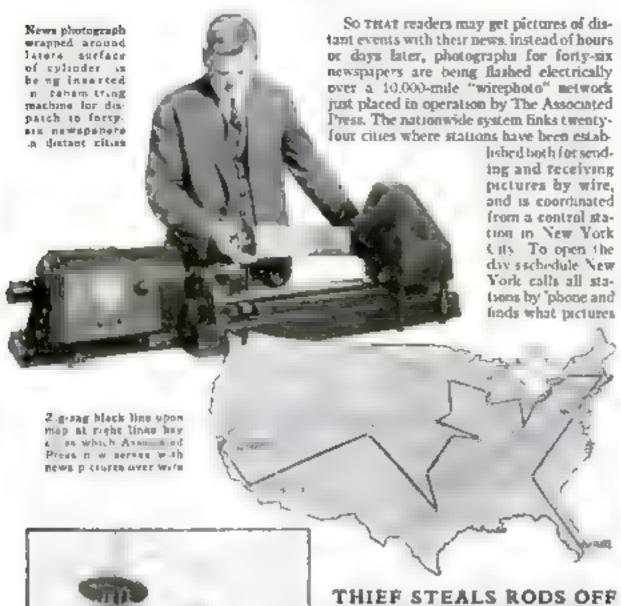
house. A third ladder, leading from the north end of the spillway trap and discharging into the channel above it, probably will be added as a safety precaution, and a fourth may go around the dam on the south side of the river

To most salmon-wise people these fish ladders seemed to be all that is necessary But Holmes, knowing that the very existence of an important industry depended on getting the salmon over the dam, refused to take chances. Perhaps, after entering the traps at the foot of the dama the salmon would refuse to climb the ladders, or would be too weak to do so, bo he included elevators for them in his scheme

Pairs of fish locks, a good deal like navigation locks, will be built at the south end of the power-house trap, and at the north end of the spillway trap. They are designed for (Continued on page 124)



### Wire Photograph Service Spans Nation



### THIEF STEALS RODS OFF WASHINGTON MONUMENT

ONE of the strangest thefts on record was revealed recently with the reported disappearance of 107 ministure lightning rods that were being substituted for older ones atop the Washington Monument Apparently an audacious thief had taken advantage of the huge scafold used an renovating the monument to commit one of the loftiest of burglaries. Plated with gold and upped with platingen to avoid corrosion, the rods were valued at eight dollars apiece



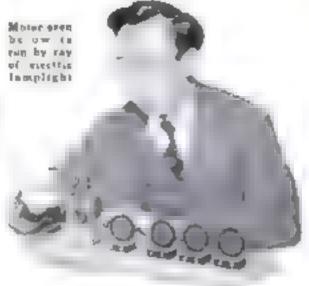
Workteen replacing stoles lightning rods

they have, and the order of transmission is decided according to relative news importance. Each station, in its assigned turn, places its picture upon a transmitting machine, and the twenty-three other stations in the hook-up receive the photograph amultaneously, Pictures coming in from bour to bour during the day are similarly bandled. Often sixty or more are transmitted daily. The apparatus applies a standard principle. Synchronized revolving cylinders at sending and receiving ends carry, respectively, the original picture and a sheet of sensitized paper. An electric eye scans the original and translates the lighand dark portions into electric impulses that actuate a flickering beam of light in the receiver and impress the image on the sensi ized sheet

In lightproof case, picture leaves receiver



### GNAT-POWER MOTOR RUNS ON ENERGY OF SUNLIGHT



Demonstrating what progress has been made thus fat in attempts to harness the energy of the sun a rays. General Electric Company engineers recently exhibited four small cells of plannum-chated selen um that have the power of converting sunlight into electricity. Even the light of a seventy-five-watt lamp causes the bank of cells to generate enough current to run a tiny motor rated at four ten-in: llight of a horsepower Inventors seek still more efficient means of capturing sunshing.

### TOWER IS SCHOOL FOR PARACHUTE JUMPERS

So TRAT novices may learn the sensations of parachute jumping and acquire confidence before they venture to leap from a plane, the Soviet government has established a training tower at Moscow that is believed to be the first of its kind in the world. A spiral stairway leads to a jumping platform at the top, where the tyro adjusts the harness of a permanently open parachute and leaps into space. A wire cable checks his descent for safety.

# READS WATCH TWO MILES AWAY

A HOMEMADE telescope recently completed by an amateur astronomer in Chicago, is so powerful that by its aid its builder can he claims, read the time on a nocket watch at a distance of two miles. The builder, who is a printer, did the whole job himself, even to granding the concave reflecting marror. The barrel of the instrument consists of a framework of pape, goined at half the length by union counce tions. When these unions are unscrewed, the top hal. of the barrel may be forded back, making it possible to store the telescope in a limited space. Although the instrument weighs 500 pounds, wheels attached to the stand permit it to be moved about with comparative case. In the photograph of the left, the builder is shown beside the telescope bolding the bomemade reflector which represents the most diffi



### SALVAGE MEN CLIMB UP TO DISMANTLE A WRECK

FRENCH salvage engineers are tackling an unutual job in the Mediterranean. The Nicholds Paquet, a vessel plying between Mar-scilles and the coast of Morroco, grounder, on the rocks, and remained with its stern rearing high in the air and its bow buried in the waves. Salvage men climb to the ti ted decks on rope ladders and lower dismantled parts of the vessel to waiting ships.

### FIRE TRUCK PUMPS COMPRESSED AIR



cult part of the job

Parenes with masks for breathing compressed air from pump.

I'v meing air instead of water, a new truck recently added to the Sun Francisco, Cast, firefighting equipment supplies fresh ar to men wearing masks and compressed air to special hammers employed in cutting through doors and walls. A special reducing valve on the fireman a belt makes it possible for him to adjust the amount of air passing through but mask, diminishing the pressure for breathing purposes. As a safety feature an automatic check valve is built nto the mask. It closes if the air supply is cut off or stopped In such a case, a special canader of chemicals purifies the ar breathed by the fire fighter until he can get out of the danger zone or restore his connection with the source of supply



PLAYING CARDS PICTURE

GOVERNMENT OFFICIALS

ing deck are proposed by a New York in-

ventor, who houls the court cards handed

down from past centuries to be inappro-

priate for a modern age. For the king

queen, and jack of the standard deak he

would substitute three cards to be known

respectively as "president," "governor and "mayor." The new cards, he suggests

might bear pictorial likenesses of these na-Honal, state, and city officials, together with additional information such as are and birthplace, thus giving them a defi-

nite educational value

New faces for the face cards of a play-

Like western countries, Japan has turned to stream med locomotives, and its enerneers have produced the sleek steam engine pictured here. It draws a speedy train which has been placed in service in Manthuriz on the 440-mile run between Dairen and Hanking. Its schedule calls for the trip to be completed in right and a half hours, two hours less than the time formerly required. For the comfort of passengers, cooled air will be furnished to the passenger coaches of the train.



### BOAT'S MAST REVOLVES TO ROLL UP ITS SAIL

A SALUBLAY with a revolving mast 1 a treent irea on o Fredrik Lyingstrom. Swedish engineer. The old design is introded to make the craft easy for one person o bandir since spreading and taking in the salure of the mast. A succialing is used, consisting of a single double to led sail fastened to the mast.

### PHOTOGRAPH PLANE IS WINGED CAMERA



Prior aims camers by pointing the entire plane at the target using a gun sight as view finder

A VINITURE thing camera has just been completed for a Detroit Mich tempaper. The speedy abotographic air plane thes at 300 m les an hou while the first a ms a camera in he wing the normachine gun, by pointing the whole paper at the target. A gun sight on the pilot swindshield serves him at a view finder. When he prester a button on the control.

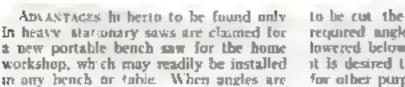
tack the electrical van nated camera also 110 pu tures at two-second intervals. Auxiliarly cameras take photographs news ward and to the mar. The muchine is equipped with a me harnest rolot to allow the operator complete freedom in taking pictures. Before being piaced to service the machine will be demonstrated before War Department officials.

### NEW BANK WINDOW FOILS HOLDUP MEN

A BANK was low designed to make things not for the holdsp man has been invented by a former Army engineer. In case of an attempted robbery, the teller needs only to move his knee against a holden it gger bureath the inner side of the window likeline the criminal could possibly make a threatening gestore a spring actuated budet proof shutter sides upward at terribe speed, eff cavely barricaching the window and even knocking a weapon from the thug's hand if one has been thrust between the bars. Manwhile an ear-piercingalarm is automatically sounded.

### LIGHT BENCH SAW TILTS FOR ANGLES







Above portable best, saw n use, tilted to cut at an augle

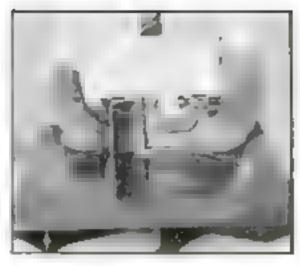
to be cut the whole saw unit talts to the required angle. The saw blade may be lowered below the working surface when it is desired to use the top of the bench for other purposes.



Slight pressure on concealed (rigger closes, builet-proof window and sounds burgler starm

### FREEZE QUICKSAND TO BUILD SUBWAY





### NEW FOUR EDGED SQUARE AIDS MACHINIST

FASHIONED with both ends square with each of its four vertical edges, a surfaceplate square just introduced by a manufacturer of precision tools makes it easy to check the trueness of machine parts. tooks, fixtures, and various set-ups. Because of its unusual design and weigh. the square stands firmly and cannot enally ie upset. Instead of a single thin hade it has four solid edges, all standing perfeetly upright upon the surface plate. Its substantial one-piece construction also protects it from variations due to handing and temperature changes. Made of hardened steel, it is four inches high and approximately three inches between opposite edges. The photograph shows it in use

### CHEMICAL WIPER MELTS SLEET ON WINDSHIELD

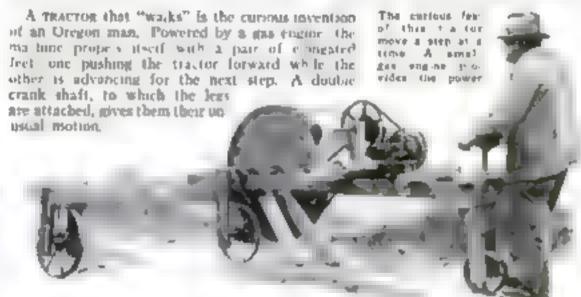
Antwerp, Belgium, as described in this

magazine (P S, M, Nov., '32 p. 24)



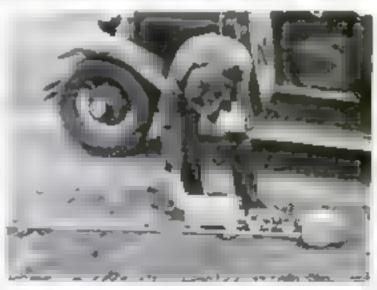
An EMERGENCY windshield wiper especially designed to prevent sleet from forming has just been placed on the market. Designed to be substituted for the regular one at times when the coated pane endangers driving, the new wiper contains a chemical substance that is said to dissolve ice already formed and to sweep away snow and sleet thereafter, before it can cake. The substitute wipers are mexpensive and fit any car

### HOMEMADETRACTOR "WALKS" ON WHEELS



### MINIATURE RAILWAY CARRIES MAIL BOX

To save himself the trouble of wasking half a mile from his house to the highway, the owner of a Northern Point Ore., ranch house has constructed a miniature electric railway to deliver his mail. Its single cur is a ventance mail hox on wheels, which he dispatches toward the road. When it arrives at this point a lever automatically stops 4 The postman deposits mail in the car and turns on the switch, whereupon the car scoots back to the house with the letters. Dry batteries operate the power plant of the midget thail car



The postman puts letters in the mail car and off it goes



# Airplanes Help Mine Gold



Peruvien narrives descendents of the ancient Incan moleculing a heavy piece of machinery from the plane which has brought it arety miles and across mountain ridges more than 15,000 feet high. A mule train rould not make the trip by trail in thirty days

Pilot Tells Thrilling Story of Flights Over the Andes in Planes Carrying Heavy Cargoes

### By T. F. JARDINE

MONG the craps of the upper Andes, 15 500 feet above sea level, an ancient Inca gold mine has just been equipped with modern machinery flows to the spot by plane. Seven bundred tons of steel rode on wings to the amost maccessible site of this world's highest mine. Later on, gold places will carry the precious back to civil senion.

As chief Pilot for the Pan American-Grace Line in Pera, I was put in charge of the work, early last summer. Our job was to take off at Cuzco, 10,900 feet above sea level, climb through thin prover a 15,000-foot ridge of snow-covered peaks and then, with more than a ton of steel in the fuselage behind us, sit down at high speed on an improvised moor ain rupway.

The mine, known to the Indiana as Coochasty-buas, was producing gold before the arrival of Francisco Pizairo, the Spanish conqueror. With antiquated, hand-labor methods, it turned out a million dollars worth of yellow metal in the last two decades. In 1932, a group of Peruvian capitalists bought the more and occided to using modern machinery. Only pack trails, winding 134 miles through mountain defiles, connected Cuzco with the epot Mule drivers took from three to four weeks to get through and 300 pounds were the maximum they could carry in one piece. And such loads took six weeks to reach the mine. To solve their problem, the owners turned to cargo planes.

One of our all-metal, tri-motored Ford passenger planes, the San Fernando, was selected for the work. We first removed all the interior fittings from the calan. Then we cut a hatch, about nine and a half feet long and four feet wide, to the top of the fuselage. All the windows with the exception of



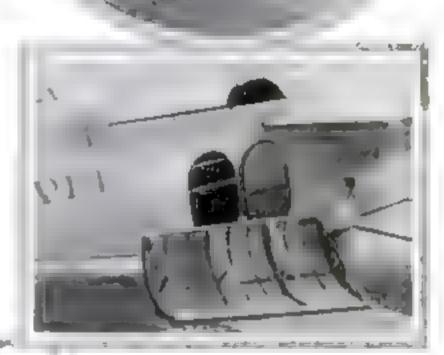
At left, the San Personds and San Felips are seen lined upon the mine a landing field beside a load of freight they have transported from Casco in two hours. The picture below shows workings carefully unloading a huge cylindrical piece of equipment through the improvised harch out, a the fuscings of the San Fernando.

Above Clouds

two, were blocked up with sheet duratumin. On the floor of the fuselage, two rails supported a small cor connected with a cable winch. Onto it, we lowered the heavy pieces of machinery, then pulled them forward to trim the ship before securing them in place.

In the meantime, 3,000 natives of the region, descendants of the Incat, were hard at work on a small plateau a few miles from the mine. Wild limites used to feed there, hence the name of the plateau Huanacopampa, or the flama pasture. Its elevation is 12,800 feet. As no machinery could reach the spot, picks and shovels uided by dynamite, were employed in clearing the runway. Six months passed before the job was done. The result was a narrow strip of level ground 4,290 feet long and 330 feet wide. The runway is marked on all sides with white chalk so its boundaries are easily noted from the air. A chalk line running down the center of the strip aids in cross-wind landings. The field runs east and west and ties between two high ridges of the Andes.

In the spring of 1933, I began the serial freighting, flying in fifty-five tons of machinery and proving the plan was practicable. The real work of heavy hauling, however, started on August 14, tast. Instead of 134 miles, the pack-trail distance, we traveled airline, sixty miles. And, instead of nearly thirty days, required by



Above is shown the batch that transformed a passenger plane into a cargo acreer As all the sanding field of Copes, from which the difficult take-offs were made



mule travel, we covered the distance in a cittle more than thirty minutes.

Let's follow the steps of such a flight. The start in from Cusco, the sucient lines capital. The surport, also used as the municipal trace track, is only fifty feet wide, stretching like a narrow road for 4.400 feet. At one end, native workers under a Peruvian foreman boist into the air heavy pieces of steel by means of a boom, gin pole and double hand winches. Then the cargo ship is rolled under the daughing load, the steel descends into the fusciage of the plane, is hauled forward, secured, and all is ready for the start

The Son Fernando has twin 550-horsepower supercharged Wasp engines, one on each side and a 450-horsepower Wasp in the nose. All three are souring at full throttle when we lumber down the narrow runway and (Continued on page 119)



With a surgical haifs. La Place Bostwick makes an incinion to the body of an abalone

### By Andrew R. Boone

RAVING high waves, experienced hunters pried several abalones from submerged rocks along the southern Cautornia coast Next day, with the skill of a surgeon, a "pearl scientist" operated on the abalones, placing within each a tiny, rounded piece of shell. Two months later, be again per formed an operation, removing the resulting grow h from each mollust. In every case, the abalone yielded perfectly formed, unattached pearls.

For centuries man has sought to "hand grow" pears. With a single exception, no one has found the means of producing natural pearls under controlled conditions. Yet La Place Bostwick, formerly an lowageweler not only has grown pearls in both fresh, and salt-water shals, but he also has produced several large pearls in colors.

When I visited the Scripps Institution of Oceanography at La Jotta, Calif., where Hostwick is conducting his delicate experiments with almones, I saw several of these care manmade pearls, A large, black pearl still attached to the "elephant-ear" n which I was grown at Musca me Iowa, a perfectly round, pink jewel pearl grown in an exquisitely finted conch shell at Key West, Fla.; five white pearls still attached to a single couch shell in which they developed to malanty, eleven ana tached, round while pearls of various p es, taken from abalones, and a single attached pearl of generous sace stall in place against its mother-of-pearl abalone background

Never before has man or nature, singly or ingether, been able to grow a pearl in two months. True, those produced by analones in that short period have not at tained final pearly luster, but all possessed roundness of form and a perfect covering over which successive layers of the pearlPearls
MADE TO ORDER
by Surgical
Operations

2 A round piece of she'l is placed in the wound as a national around which the pair's general The mount a then weated with anticoptic

The 'patient' is now placed in a tank of a color of water to convenience. We have two months, if the modulate level, a peach is further

forming have were being grown Ottor specimens taken at longer intervals were bard and round and gave the appearance of natural pearls

The abalone in which pearls are thriving is a univalve a species o snail to the United States it is found only along the Pacific chast Several varieties of these exquantely beautiful abels occur along the California shores where I saw the hunters prying their loose from their rocky homes with the aid of leaves from automobile springs. Most of them are dark given red

and pink. Some varieties attain a length of thirteen inches, permitting room for the growth of larger pearls than may be raised in oysters. Aboliones are proposedy the most but last y beaut all shells in the work and since pearls often take on the colors of the shell within which they grow, Bostwick bopes to add several new shades to those already produced.

As I viewed the steps taken in growing pearls, I realized that this was a task few men could perform It requires knowledge gained by a lifetime of experimentation, the skill of a surgeon, and infinite patience.





Each abalone presents an individual surgical problem, depending upon its size and whether Bostwick desires to grow a free or an attached pearl. For the former he makes a dericate incision with a sharp surgical knife, then carefully places the nucleus within the body of the live anima.

"The pearl will be formed around the foreign substance by a secretion that becomes pearly nacre, the same substance that forms the inner living of the abei-Bostwick explained, as he subjected a fine abalone to the operation. "The foreign substance causes pritation and, as a means of self-protection, the abalage lays a film of secretion around at. In the case of a round pear), such as this will become unsens the mollusk dies, a pearl sac wal grow around the intruder. The inner surface of the sac will secrete the fluid which gradually hardent and becomes a layer of pearl. As suctussive layers form, the pearl will increase in size and value."

Having completed the operation and sterilized the wound. Bostwick carried the patient" from his small laboratory looking out on the Pacific ocean a hundred feet distant, into the convalencent ward, consisting of a series of square, open contrete tanks, into which see water flows, Carefully, he said his hand down a side was an deposited the abolishe on the bottom.

During the first two weeks." he said "the abalone will be rather mactive until it recovers from the effects of the mession. During this period all I can do is keep the water cool and herated. Afterward, the moleask will become active, crawling around the bottom and sides and eating with a healthy appetite the help and eel grass we kept in the tanks for food. There is little I can do to speed its recovery.

There are a few mortalities during the first two weeks, but those which har lie this di buat period uses a survive and, if the nucleus has been reperly plu ed produce pearl

a as he wartes the our ton by pine my the Personal State of the state

HOW an lower Jeweler puts
live abalones to work
making large, perfect pearls under controlled conditions and
at record-breaking speed, is described in this article.

transparent films of conclusion and caltransparent films of conclusion and caltrareous matter, is more profuse near the hinge and decreases toward the thin outer edges of the shell be inserts it nearly half the distance toward the thickened binge. If the location is right and conductors are favorable, the pearl will grow "cometimes increasing size causes such pressure that the pearl bursts through its covering and is released. This is one of the principal reasons why few large pearls are found

Bostwick started his experiments several years upon at Muscatine, Iowa, Later, in his laboratory at Iowa City be found the secret of growing large pearls in some of the 600 varieties of fresh-water shells. During that period he also discovered that he could control their coint to a certain degree. He grew several black pearls in elephant cars.

Further experiments led him to key West. There he grew them still argurusing the great pink couch as the measure. This is a species of giant snall and a puific producer of pearls. So prolific, in fact that Bustwick found he could operate five times on a single couch and grow five

pearls simultaneously within its shell. "With the couch," he told me, "the secretion that hardens to form the inner liming of the shell and pearls is more profuse than with the bivalves. The structure of both shell and pearl is different, The nacreous layers are much thicker and less transparent. Couch pearls occur in pink, red, yellow, white, and an occasional rich deep brown. Most conch pearls are oval or clongated in shape and the clongated shape is caused by the extraordinary muscutar activity of the molausk, In coloring there is a tendency toward a gradual shading into white at the ends. Few round or egg-shaped pearls occur and if one is found that is of good size and quality it usually fands its way to a Prince or Rajah of India Pink conch pearls, called 'rose perler by the French, are the most highly prized. There is said to be a fine conch pearl from Key West in the crown of Sweden. Conch pearls or quality are little known in the United States, as they usually go to Nassau and from there to London. Paris, and the Orient."

While experimenting with conch pearls Hostwack "harvested" a round pink jewel pearl weighing furty-three grains, valued at \$5,000. His successes with "horbouse" rouch pearls led him to the Pacific coast and its beds of abalones, whose play of green, buses; een, fawn-yellow, and red offer an opportunity to grow pearls of rare colors. Many "pearl blisters" are now obtained, but well shaped abalone pearls are rare. Madame Nordica owned a large abalone pearl, shaped like a tear drop and weighing 176 grains. Such pearls are almost never found and are worth thousands of dollars.

Pearls differ in shape and quality according to their location in the shell or anatomy while growing. If in contact

with the shell, they will be come attached and if the poll, oks' organs or mas a movement in orders with a grow h, the resulting pear may assume an unosual she a bifute the secretion has a by various presupent if it may

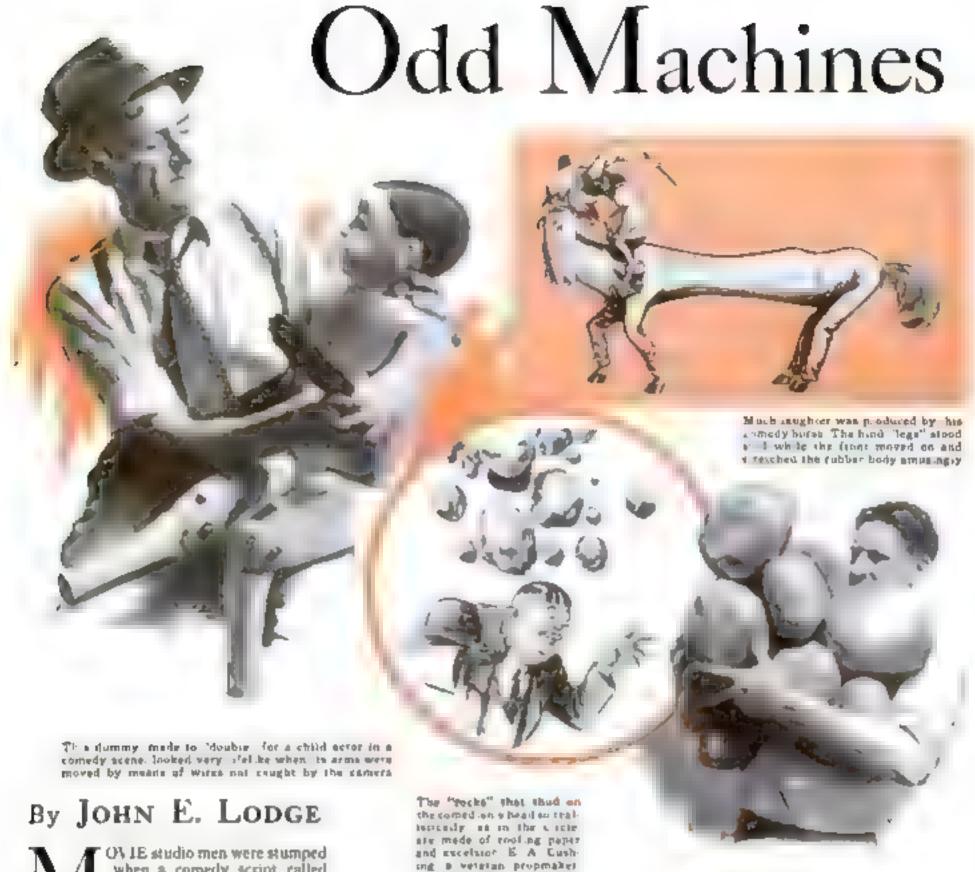
el button havatack touble beader wine leaf print lay and or

5 p









ON IE studio men were stumped when a comedy script called for an oyster that would open its shell and wink one eye. But a New York maker of comedy props welcomed the job. A few days later, he appeared at the studio carrying an ingenious shell made of papier-mache. The two halves opened and closed on a spring hinge and an eye within winked when a studio man pulled a hidden string

In another picture, a laugh-getter was a bow tie that spun around like a propelser every time an actor swallowed. A crack propmaker spent two whole days designing it. Secreted within was a coil spring Every time the comic swallowed, his Adam's apple tripped a release lever and set the tie whiting.

From the studies of Hollywood and the East come frequent requests for such curious, absurd, factastic bits of mechanism. They appear for a few minutes upon the screen, get their laughs and are never used again. Yet, not infrequently, it requires days of study and infinite ingenetity to produce them.

The men who supply these mechanical aids to comedy, are behind-the-scenes workers. They often work on a free-lance basis in little shops of their own. Their names rarely, if ever, appear on the screen when actors, directors, costumers, cameramen and technicians are given their due. However, their skill is vital to almost

is seen at right with a load

weighing only five pounds

A few months ago, for example, the big laugh in a comedy reel came when the hero went fishing. The trout played tag around his bait and finally came to the surface and squirted water in his eyes. The comedian nonchalantly reached into a pocket, pulled out spectacles equipped with little windshield wipers and went on tishing

That scene clicked along on the set without a bitch. But, behind it lay days of work and experiment. The spouting ash, I was told, were realistic imitations cast in rubber. Long tubes led off-stage and ended in builts. When these were squeezed, water squitted from the fishes' mouths. A laboratory workshop turned out the trick spectacles. These had invisible threads running down the actor's sleeves by means of which he operated the insleet wipers.

Of comedy propositions, the New York firm of Messmore and Damon is probably the most famous. With machine shops, papier-mache rooms, carving benches and 27,000 square feet of floor space, it turns out a weird list of products ranging from cubber asparagus to mechanized prehistoric monsters; from sixteen-foot saxophones to animated cupids that shoot arrows, from a winking statue of George Washington to a black stork to deliver a Negro baby.

This concern has made so many comedy props that it can quote prices over the telephone for almost any fantastic mechanism you can think of. A basa-wood alarm clock, a mechanical spader and a whirling neckies for example, would together cost you in the neighborhood of a hundred dullars.

On the day I visited the plant, workmen were putting slide fasteners in the hind legs of a borse. The initiation animal was to double for a real borse in a comedy. Two actors in the legs were to go into a come dance and the slide fasteners would

# Put Fun in Movies

enable them to get in and out. The body was formed of popter-mache and the legs of a special fabric. Viewed from across the room, the real horse and the imitation animal could hardly be told apart.

A few days before, finishing touches had been put upon a mine-foot came! Slide fasteners in the humps enabled comedy characters to use them for luggage car ners on a burlesque trip across the Sahara. Another ludicrous prop was a horse with rubber-fabric sides. During the action of the comedy, two actors loside the horse were supposed to become tained up in their signals. The rear legs stood still while the front legs kept on going untitle horse was stretched to three times its normal site.

Such orders are all in the day's work for the proposition. Requests for trick fountain pens that pour out ink when the point is pressed against paper, for rubber starrup strops that stretch and then fly back when a come starts to mount a horse, and for trunks that are designed so they fact apart when a string is polled, are comparatively easy ones.

An expanding turkey which was ordered but year, however, was not so simple. It

CROCKERY MADE TO BE BROKEN

The Bitcher at the right was made by coating the maide of the mold with pies. ter of Paris Taken from the mold and given a coas of page it looks beary and maber areas. attic crash when shattered before the microphage Was objects do par register well



This comedy takens was covered with queer gadgets and accessories designed to bring laughts from movie lans

was made of special robberized labric and contained a heavy rubber balloon. In the comedy in which it was used, bushels of dressing were stuffed into the turkey, the dressing being shoved down through a bole in the table while the balloon expanded farther and farther until the bard was the sace of an ostrick. When a knife was stuck into the find at the Thanksgiving dinner, it collapsed to the size of a robus.

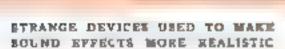
Another puzzler for a Hollywood prop designer was a breathing cake for a Hal Rouch "Our Gang" comedy. Five children had gathered around a birthdayparty table when the huge frosted. A fragile choices ghang one pound and a stall of the years from which it was made

cake in the center began to breathe expanding and contracting while the guests eyes popped on in amazement. The take was rowered with rubberized fauric over which he froating was placed. A battery of small on some encircled the cake beneath the outer covering Off-stage.

workmen pumped air in and out of the balloons, producing the appearance of breathing

The other day a comedian on a Hollywood set reached for a broom, intending to frighten his co-star with a playful tap on the bead. Instead, his hand grasped a sledge hammer. Swinging it in a great are, he crashed it down on the skull of the other actor. The blow was so hard that it broke the hammer. However, the complete tool weighed only three ounces and the head and handle, both made of desert yucca, were stuck together with two tooth-packs and a little mucilage.

Every fall, Rollywood prop men scour the desert footh is of Southern Califorma fighting ratt esnakes in their search for vucca (Communication page 114)



The antice of two concedians when cartridges exploded as a camp fire made a funny scene, but the sound that the audience heard was made by exploding firecrathers in a garbage can, as as shown to the photograph above

# Small-Bore

### ENLISTS ARMY

By
ROBERT
E.
MARTIN

the chief reason is that guns and ammunition of this caliber are not expensive. A fairly accurate "twenty-two" can be purchased for less than five dollars, although you can pay several hundred dollars for a gun of the same caliber, if you want to do so. The 22 long-rifle cartridge, the size used for most serious small-bore shooting, is accurate enough to satisfy the most exacting; yet it is small enough to permit its being used indoors in the average eisement, without disturbing the entire

neighborhood

You will find the typical rife club or other collection of shooters to be a diversified crowd. Here, for instance, is a marksman whose idea of Heaven is a place where he can lie forever on his stomach and put one bullet after another into a title black circle in the center of a square of cardboard a hundred yards away. He is the typical target shooter, the type that probably leads in point of numbers.

But there are thousands of r flemen who care little or no hing about straight target shooting. They demand something more exciting, something with

A basement riflemen shooting at an inger our target on which riny glass ducks are swang around by a rotor propel ail by wand from an electric for. The arrangement of the target is shown at right

OT long ago, there descended upon a few hundred acres of Northern Ohio soil a big army armed with little guns. The small-bore marksmen of the country were congregating for their grandest event of the year.

the National smal-bore matches, open only to persons who find excitement and on in shooting .22-caliber riles

Although this national match, which lakes place every summer at Camp Perry, provides a cross-sectional view of one of the most popular sports in America its week of crowded activities is only a drop in the bucket when compared with the total of small-bore activity. In every town and hardet from the Southwest to the heart of New York City, you can bear the crack of the little "twenty-two." It casts its magic spell over small boys and total tering granddads ance

That shooting is a leading bobby is indicated by figures prepared by the National Rifle Association, which governs recreational shooting activities and acts as a sort of clearing bouse for information on the sport. There are, according to the estimates, at least 100,000 junior shooters who burn up powder more or less regularly, boys in their teens for the most part-and girls, too. Then there are some 250,000 grown-ups who are known to be active in rifle shooting. In all, there probably are more than a half multon persons in the United States who are capable of hitting something when they shoot a. it Some are expert shots, others are just shots, and the great majority are probably more skilled in the art of shooting

than many a military

A though this stable army of shooters is strictly a bunch of hobbyists who go in for guns and buliets as enthusiastically as other people follow amateur photography or stamp collecting, it is providing, as a sort of by-product, an important reserve force that would be valuable in event of war. Doubtless, too many a highwayman has had his career terms nated suddenly because some bank clerk or gasoline-station operator was an amateur shooter. Congress has recognized the importance of amaleur shooting, and has done much to encourage it Unfortunately, the depression has made necessary a curtailment of this encouragement in recent years.

Most of the firearms used by amaleurs are of 22-cabber size. Perhaps



Another mechanical target, with a gines doer mounted on a broycle wheel which is turned by a small electric motor. A piece of boiler plate protects the wheel from stray shots

# Shooting Hobby

MARKSMEN

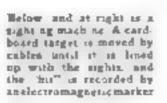
more action in & Among them we find the grow and woodchuck honters, tin-can marksmen and the like

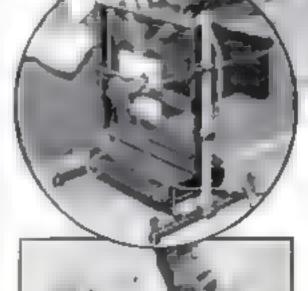
And then there are some gun (ans who se dom shoot at all. They frequently have a large-sized arsenal, but a surprisngly small supply of ammunition. In this group are the collectors of firearms, and the amateur craftsmen who construct specia. stocks, or even make entire guns that rival commercial products. In fact, many active riflemen find pleasure in constructing their own gun stocks and making other afterations that fit their frearms more closely to their personal tastes and needs.

One of the simplest, yet most interesting of outdoor targets consists of nothing but a brightly colored disk of wood measuring about one-fourth by one and onefourth inches, and equipped with a metal pus so that it can be fastened to a tree tence, post or other support. The disk resembus a checker purce, and breaks when is it struck by a bullet. These inexpensive daks have become so popular for "plinking" targets that they are sold by the Lhousands

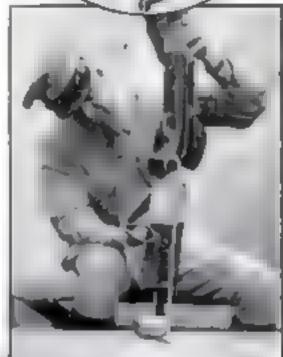
Another povel shooting sport makes use of an elephant turget. This is a picture of a running elephant that is divided into luncks of various shapes. Each division is ossigned a definite value. A hit in a tusk cat, tail, lip, or trunk counts nothing these being the least vital spots. A hat in the head or flank counts three; in three body areas, four, four, and five, respect vely, near the heart, six, near the brain seven, in any leg, seven the backbone,

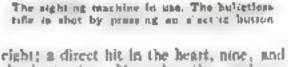
> At right, the trigger of a rifle is being "we ghed" to determine the pressure requited to fire it in actual target work











the brain, ten. Normally, the curphants are shot at from fifty feet with pistor, or 100 feet with rifle, five shots being fired in fifteen seconds; or some similar combination can be employed. In all, the elephant target provides something different tor shooters. It measures twelve by eighteen inches, and is printed on heavy card-JOBSO.

This idea of using printed images of came animals as targets has been developed into a series of colored paper largets on which the animals are depicted life size. Some pictures have a superimposed buliseye, with the center over the most vital spot. Most of the animals and birds are pictured in a running or flying position, so that the targets can be mounted on 1ght cardhoard or cloth stretched over a frame, and equipped with a cable-andpulley mechanism to move them across the field while the abouter bungs away By mang colored paper stickers to cover up builet holes, the life of such a target can be prolonged indefinitely. Among paper targets available are those showing a running deer, elk, and rabbit, standing cabbit, flying pheasant, duck, hawk and quail, standing deer; sitting bawk, and running pheasant, fox, and small deer

Mechanical targets have become pupular with small-bore shooters on both outdoor and indoor ranges. One type of target consists of a metal box with five projecting bull'a-eyes. When any of the four outer bull's-eyes are struck, they drop out of sight. A hit on the smaller center bull causes the four others to reappear. Another target working in a similar way has a center bull's-eye flanked by two "dodo" heads. When the beads have been knocked out of sight, a shot on the bull's-eye brings them into view again. Such targets are also suitable for use with the more powertul air rifles.

An inventor recently perfected a sighting device that provides shooting experreace without the necessity of firing a cartridge. The shooter reverses the usual



process and moves the target instead of the gun. The target consists of a cardboard sheet with a bull's-eye printed on one side. This is attached to a pair of cords which can be moved by operating control wheels attached to the gun rest. The rifle or postol is held securely by the rest.

The shooter sights along the bacrel, and by theans of the cords moves the target until it is upporently in position for a bull's-eye hit. Then he preses an electrobution, which causes an electromagnetic uevice to force a pencil against the back of the target, making a dot at the point at which a bullet would have hit if one had been fired. Before the "firing" is started, the gun is sighted accurately on the spot at which the mark is made. The inventor oclieves that his device will be of value to police departments, rifle clubs and other groups desiring shooting practice we hout the shooting

Shooters who are fond of card playing have been provided with a target designed for "potter shooting." This is a printed layout of playing cards, with two jokers and two "M" cards that count as misses. Draw or stud poker can be played. Frank P. Carey, inventor of the target has suggested that any betting involved be done with .22-casiber cartridges instead of money. One poker target is good for at least fifty shots from a .22-casiber pistol or ride.

The building of small indoor ranges in basements usua ly is becoming a popular. a tivity among shooters. Such ranges are casely set up, when space is available and a suitable back stop can be arranged for keeping hulets within hounds. Heavy turbers or sheets of bodes plate set at proper angles to prevent dangerous rico chets can be used. Another way of stopring bullets is to use a metal lunnel device manufactured for the purpose. This apparatus catches the bullet, allows it to spin around a while until its energy is spent, and then drops it into a container from which the accumulation can be removed for melting to recover the fearl

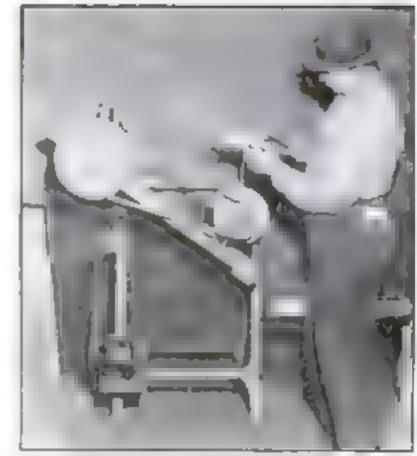
When conditions are unfavorable for regular ama l-hore firesems, excellent shooting can be done with one of the highpowered air rifles or postols available. These guns use compressed air charges instead of powder, for propelling specially shaped read slugs. steel or lead bals or feathered darts. They are remarkably occurate, particularly over short ranges, and most of them shoul hard chough to k I rodentand other small game

The boiding of novel competitions is be amng a common pra the of gon cuts. In addition to straight target shooting, all kinds of freak target games are employed to arouse interest of visitors, Such events are really shooting carnivals, with visitors paying so much for the privilege of shootone In addition to maiing money for club activaties, these gun carpivals usually atera to

many prospective members who may join frientive genius apparently knows no bounds when it comes to working out unusual ways of using up powder and read. The Zeppelin Rifle Club of Akron, Ohio, for instance, staged a shooting carnival that included elephant bunts, tages hunts, and other hig-game activities. Tiny class elephants normally intended for the as watch charms were employed as targets in some of the shooting games. Electric motors, old washing machines and other odds and ends were used for optrating moving targets.

But in spite of the many byways of shooting, the very foundation of the smallhore sport in America is straight target summed than

While much shooting is done in fuscments and fields by persons who care lit-



A mechanical tiger target operated by an old washing machine mover. The object is to also out the entail glass disk seem to the man's hand. This represents a will appear in the animal

the or nothing about competitive matches, the rifle club provides for others the opportunity to match their skill against rival gun artists. Competitive small bore shooting is done generally at ranges of fifty 200 and 200 yards, and at fifty meters. The fifty-meter range was used officially for the first time in 1934. In addition, there are rifle targets available for ranges as short as fifteen yards, and pastol targets for panges from twenty-five feet up.

One of the most interesting 32-cauber competitions in the Dewar match, the American part of which is shot at the annual Camp Perry small-bore meet. The competition is between an American team of twenty shooters and an English team of the same size. Scores of each team are sent by small to the other country. In the 1934 match, the English team completed its shooting first, and one of its members made a perfect score of 400. Not to be outdone. Sam Bond of the American team hung up a similar perfect score of Lamp Perry later in the season.

A noteworthy fact about target shooting in that instances of accidental injury on properly constructed and supervised ranges are extremely rare. The man or woman who is familiar with frearms and who finds pleasure in shoot og them has, in almost every case, developed a proper respect for their power and a love for them as a hopby tool. That is the attitude of the typical shooting hubbyist atkl it leaves no question as to the wisdom of encouraging the income and thoroughly American liking for firearms, inherited from a proud ancestry of pioneers and iconfierance for whom the squirrel rifle was both a weapon of defense and a means of obtaining food

The growth of cities and the increase in tarban life with its acclentary occupations have enued to terrace he opportunities of the American to include his enthasiasm for the 1th and the moving target. Promotion of rife matches everywhere now is enabling him to shoot.



Worn-Out Auto Tires

REBUILT BY NEW PROCESS

YEW tires for old are offered today's motorist. Instead. of discarding a casing worn out by twenty thousand miles or so of service, he may have it "rebuilt" by modern scientific methods. He gets back a tire that looks and wears tike a new one, according to specialists in the work, but costs only half as much.

Photographs on this page, made especially for Porthag Science Monthly, show how the process is carried out in a typical shop. It consists of removing all traces of rubber adhering to the body of the fire and forming a brand-new tread apon it, much as a shoe is resoled. Since the body alone

represents sixty percent of the cost of a new tire, an appreciable baying resture

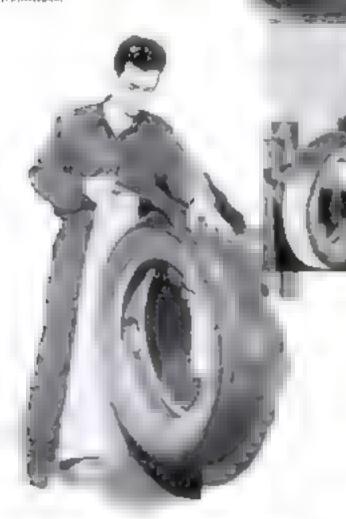
Recent developments in motorng have helped spread the new fash on of reast ling tires, and mul iplied the number of shops specia izing in it. The body of a modern tire, expert rebut dest point out, is far stronger and more readject than that of former types Concrete roads spare if the bruis ing blows of rocks, ruts, and rued bumps. Hence it may stu be good for long service when the runber read worn down by the powerfubraking and quick starts of pres ent-day cars, is acmost gone. A careful examination is always given to make fore the body is intect for rebuilding it. Jessible only when it is free from breaks and signs of wenkness.

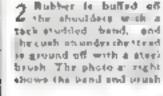


OLD RUBBER COMES OFF The first step to substiding sharp knots made of fire steel.

a workness pares of the old rub ther is at his, going an , page to the gold an his wan with antoty







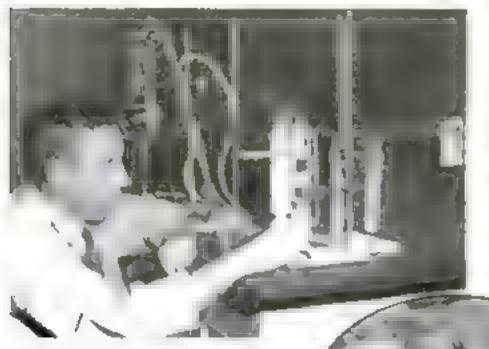


3 The body of the tire is given two costs of subber camenthat used in new time is applied to cover the top and sides

### NEW RUBBER BONDED OR BY VULCANIZING

As the final process, the new trend is valcanized to the body in T a strate-jacketed curing could. The new rubber fit is the spaces between the cords and forms a perfect bond. The tire is now ready for use

### ROBOT SMOKER AIDS CIGARETTE STUDY



Left, tobol smoker pulls a cigarette and reparates the smoke morricamponent parts for a study of necessary and atara removal

In oval, preparing experimental models of 6. ers to Lake Objectionable substances from tigarette amake



### SNOWSHEDS JOIN LONELY MOUNTAIN POWER HOUSES

Snowskiens have found a new use in the mountains of Caufornia, where they enable workers of a great hydroelectric plant to travel to and from their homes. and to get from one power house to another. Since it is not uncommon for snow to be piled ten feet deep after a severe storm the snowsheds often afford the only means of getting about for those without snowshoes. The sheds resemble those used to keep rai road tracks clear

A MEANS of divesting digarette smoke. of fifty to seventy-five percent of its picotine, and most of the tarry distil ate that causes stains, in the reported discovery of Prof. F. Aimy, Ohio State University, hemist. It may be incorporated in a diminutive device that is built into a rigareite boider or inserted directly in a cork-tipped eignrette. The device draws he smoke through a rutton pad and a chamore filled with granules of activated carbon. The first removes the tarry sale stances, the second, the nicotine Tests

with a robot smoker that automatically smokes a cigarette and analyzes its smoke led to the choice of the materials employed

### NEW DRINK DISPENSER FOR AUTOS

WITH a new drink dispenser attached to the panckag of his car in motor of may now sinke his threst while driving. The container, he d in place by a spring el p, has a cup attached to its lower end. To get a drink, the motor at preases a plunger in the side of the container and releases the cup by

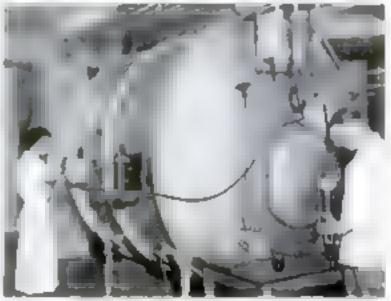


Driph container for euromobs 49 showing how sup to Grunthed

giving it a partial turn. The container is heavily insulated so that cold liquids placed in it are kept cold, and hot liquids are kept hot, for long periods of time

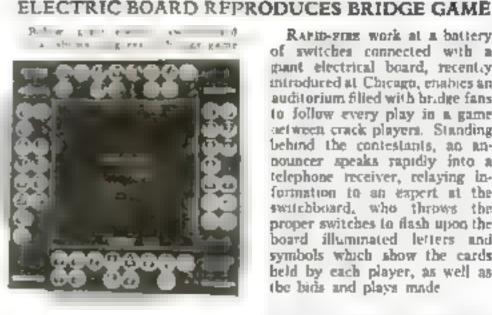
### TESTS SHOW THAT GERMS FLOAT IN AIR

BY SPRAYING germs into a huge meta tank bood with gass W ham F Welk Esarvard School of Puone Health samuation instructor is learning new facts about the spread of disease. Conteary to prevailing medical benef his tests are reported to instrate that minute Iropiets of moisture expelled an the act of coughing or sneering do not settle rapidly to the floor but float in the air, with any germs they may contain, for a considerable period. The germs. moreover, do not die quickly but may live for hours. The tests may affect autconditioning plant design.



Camples of air being withdrawn from tank for gurn best

Francis or selection that pula figure unique presso da



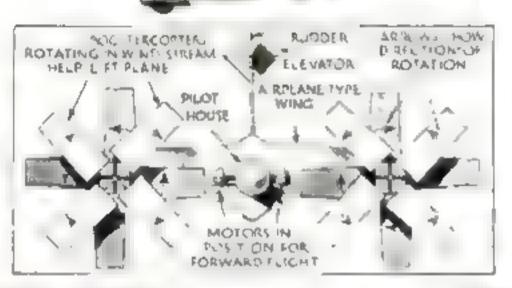
RAPID-FIRE Work at a battery of switches connected with a gunt electrical board, recently introduced at Chicago, enables an auditorium filled with bridge fans to follow every play in a game netween crack players. Standing behind the contestants, nouncer speaks rapidly into a telephone receiver, relaying information to an expert at the switchboard, who throws the proper switches to flash upon the board illuminated letters and symbols which show the cards held by each player, as well as the bids and plays made

Flying Whirligig
Is Newest
Aircraft

A FLYING WHIRLIGIG" combination in the principles of the standard arpiane, the autogira, and the helicopter, is envisioned by a Glenn Dale

Hara's how new as monater may look in flight, us ng both windom. I' wanes and fixed main wips

Diagram blows how cavelying values, not more such wing tp. add fring power and enable craft to a right within very small space



airplane, the autogirn, and the helicopter, is envisioned by a Glenn Dale Md., inventor, just granted a patent. His design calls for a main wing of conventional form having at each extremity a set of wareful ake vanes or boostercopters, arranged to rotate freely when the craft is in mution, their lift aids the main wing to support the marhine. The two rotors of each set revolve in opposite directions. Twin propeliers, flanking an elevated "palot house," constitute its power plant. They swing upward to provide additional lifting force during the takeoff and return to horizontal position for forward flight. The inventor foresees the construction of bage air mers which could leave the ground or alight in congested areas where space is him ted

### MAPS EARTH'S MAGNETISM



A current pattern of loops adorns a geographical globe recently exhibited by A. G. McNish, of the Carnegie Institution's Department of Terrestrial Magnetism. Lines depict the earth's magnetic field and center about the magnetic poles. The model illustrates the behavior of the earth as a big magnet, and demonstrates the daily variations of magnetic force.



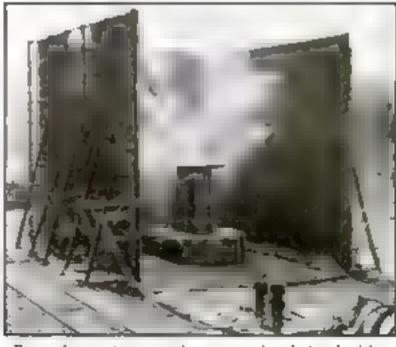
### RUBBERS FIT IN UMBRELLA

COMPLETELY equipped for rain is the user of a two-in-one usnorella containing a pair of cubbers within its handle. Tightly colled to occupy little space they are withdrawn in a july as shown above. When the bandle is in place, as below, the timbrella appears to be an ordinary umbrella, in every way



### FIRES SET IN ODD SAFETY TEST

Spectaction tests recently were made by a Maryland power company to learn how best to compat fires in its hore oil fided transcormers. Eageneers constructed an outdoor enclosure for the trials, set up a standard transformer, and repeatedly set it allame. From the sidewalls, streams of water and of chemicals were spilled upon the blaze. As a result of the tests, an effective nesson has been worked out for fire-fighting equipment that has now been sustailed to guard against damage.



Power-pleat engineers watch apparatus they designed subdue transformer fire purposely set in safe outdoor laboratory



### SAFETY PHONE GUARDS AGAINST EXPLOSIONS

A New type of explusion-proof telephone exhibited in Chicago, is a recent audition to the roster of curious safety appliances developed especially for use in industries where dust, grapowder, or industries where the constant has and of a biast. Not only dues the construction of the instrument guard against the possibility of an electrical spark against the possibility of an electrical spark again rounding air, but even the mechanical working parts have been designed part a park cannot be produced.

### TREES MAY FORECAST WATER SUPPLY

Tree rings belo Harry L. Potts, Denver, Colo., water department engineer to estimate the future water needs of the city. Wet or dry vears are recorded in the varying width of the annual growth rings of trees. He is charting the yearly rainfall for the past 500 years in the area supplying Denver The finished charts. be expects, will show how much water must be stored to meet any emergency, and may al so throw light on whether droughts accur in evoles that can be invecast.



Engineer graphs droughts and rainy spoils from tree's growth rings



New sanding d am which regands to hold abseve

### IMPROVED SANDING DRUM

SANDING drums, which save the time and effort of sandpapering woodwork by hand, are now available in improved form. One new type employs an especially ingenious method of attaching the abrasive sleeve. The drum itself is of molded rubber, which may be expanded by lightening a smadle nut. This family grips the encircling belt of abrasive material, making a snog fit and providing a desirable resilient hasking

### TINY ENGINE FITS FLASH-LIGHT BULB

A MINIATURE engine so tiny that a magnifying lens is needed to watch it run has just been completed by Lieut -Commander John W. Iseman, U.S.N.R., after six months of spare time work. The mode according to his information is about half the size of the world's prevalue smallest which in housed in a museum at Munich Germany. Patterned after a conventional stationary steam engine, his model, Iseman says, has working parts more delicate

than those of the finest Swiss watch. When compressed air is fed to the model by squeezing a rubber bulb, a Quaritch piston races up and down in its cylinder and a 0.2-inch flywheel spins with a family audibly whitting sound at speeds up to 3.000 revolutions a minute. The amazing model was constructed beteath a microscope, with the aid of an especially designed precision appliance known as a General lather Iseman made some of the smallest parts, including the crank pin and crank shaft of herylliam metal because



Builder of fly-sire engine warehes through magnifying gians while square og build t power, Right, engine compared with a p head, showing how incre-shift small





### PROFESSIONAL TASTER CHECKS SOAP MIXTURES

hew might envy Joseph Strobl of Los Augeles, Calif., his strange profession of tasting soap. By sampling the contents of the huge caldrons in which the product is made, as above, he can tell whether the mixtures have been sufficiently "cooked" and are done. Despite its apparent crudaty, this test is said to show the amount of free alkalimity in the soap with high precision, revealing in a moment what would otherwise require three to four hours' laboratory work. The value of this time-saving is shown by the fact that Strobl tastes seventy samples every day.



## Home-Work

### By BERTON BRALEY

THOUGH our residence is furnished.
With the best I can afford.
Old manageny well burnshed.
Antiques shillfully restored.
Cabinets that craftsmen fushioned.
For a Ghibbeline or Guelph.
—Yet my hobby most impassioned.
In for things I make myself!

Yes, there's something of a wobble

To the tables that I cobbie.

And the chairs I manufacture

Are susceptible to fracture

And my supboards lack in symmetry and tone.

Yet the worst of my creations

Brings me prideful titiliations

As I murmar "It's a poor thing, but my own?"

We've electric fans and heaters

Gadgets intricate and new,
Omon-poelers, nonelette-beaters

And I love to run 'em, too:
Constantly the salesmen bring us

Household tools—and take our "pell"

But my real kick is a dingus

That I've fashioned for myself

Something wrangled out of wire

And an ascient auto tire,

Some mechanical appliance

Which defies the laws of science

But which I have planned and figured out alone,

Though it creak and squeak and rumble,

If it works, I'm far from humble

As I murmur, "It's a poor thing, but my own"

Artisans and artists skellful
Thank me just a trifle deft.
But my life's not truly thrillful
Till I try my bandicraft,
Till I saw and place and banamer,
Build a dog-house, paint a shelf,
And get rich, authentic glamour
Out of things I make myself?

#### CARVE HUGE EYE FOR MOUNTAIN MEMORIAL

WITH the face of Washington already looming from the giant memorial that Gutzon Horglum, Jamous sculptor, is carving from the living rock of Mount Rushmore, S. D., artisans are now at work on the likeness of Thomas lefferson that will stand beside it. Photographs reproduced here illustrate one of the most inferesting operationsthe carving of an eye whose size is appreciated by comparison with the man alongside in the picture. The design curious when viewed at close range appears startlingly life oke when seen from he base of the lower-



here of sculptured eye shown by Agure of man



Workmen outlining the colousel eye of Thomas Jefferson, Note drill holes



Transman taking orders from new device

## MOVING TRAIN PICKS UP ORDERS

TRAIN orders, like mail, may he picked up by a moving train with the aid of a device produced by a Missouri inventor consisting of a post set beside the truck and hearing three detachable hoops. Orders are attached to the hoops, which are so mounted that a sight pull frees them Thus the engineer or fireman may grasp a boop without moving from his place in the call. The two upper ones are for the first and second engines of a "double header while the lower one is for the conductor's orders and is at the proper height for the step of a caboose

## Mystery Gun Shoots Spot of Darkness



Aiming the gun moves the black spot so screen

TO ATTRACT customers to their toy sections department stores have recently exhibited an ingenious illusion representing an imaginary was weapon of the future—a gun projecting an "invisibility ray of pky darkness in order to have as with a smoke screen, a rocket ship on which it is trained. A spectator may grasp

the "gun" himself and tram it upon a painted screen, producing a black spot that appears to come from the gun itself and to follow its movements. The secret of the mysterious effect les in perfect synchronization be tween the "gun" and a projector hidden behand the transaucent screen which is accomplished through concealed cables as expranned in the accompanying diagram. All controls pass downward through a small tulk horizontally beneath the floor, and upward through another small tube. Two lamps are controlled from the gun tragger through wiring not shown in the diagram. One illuminates the entire screen while the other illuminates all but the spot itself, the change being made automatically as the tragger is pulled.





#### SAWS AND PAINTS WITH ONE MACHINE

With a curious power-driven machine of his own design a Cauternia man can saw wood and then, after a slight change maint with the same device. The outfit comprises a small gasoline engine, a circular saw and an air compressor. Mounted in a stand over the compressor, the saw is driven by a belt from the flywheel pulley of the gasoline enjone. By disengaging this belt and alipping another over the drive pulley, the compressor can be used to operate a paint spray gun. The device can easily be towed from job to job. Its inventor, a telephone repair man, used it to add to his income from small contract jobs near his home

## CAMERA SNAPS HARDEST GLIDER STUNT

How asing Hirth, German sailplane expert, looped the loop in a glider a photographer in an accompanying plane anapped the striking ntine tebengacen here. Since the glider phot has no motive power on which to rely, his stunt ing per formances depend upon his ability to guide his frail craft into favorable wind currents and to avoid losing too much astitude during the maneuver



Unusua photograph of difficult (est of looping the loop in a glider

### NEW KIT HELPS MATCH COLORS WITH LACQUER

MATCHING colors with lacquer in painting furniture or an automobile body, is made easy by a kit recently introduced. It consist of a set of eight cadmium-plated measuring cups ranging from one sixteenth of a fluid ounce to eight ouncet, and a stand for storing and using them, with places for paint strainers, color sheets, and formulas, and a drawer for a paint paddle and a brush to clean the cups

#### BIKE GETS SPEEDOMETER

Speciometers for bicycles are on the market, permitting a youngster to enjoy the thrill of seeing just how fast he is go-

ing. In the model
is ustrated the
needle is actuated
by a friction drive
on the front wheel
The dial is attacked to the frame
behind the handlebars. And reads
perhaps a trifle optimistically, from
sero to fifty miles
an hour.



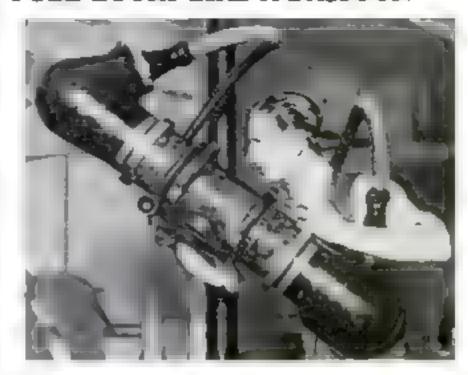
Speedometer operated by wheel of bicycle

## NEW DEVICE MEASURES THE MOISTURE IN FOG

Continuing their experiments with artificial means of dispelling log. Henry G. Houghton and fellow scientists of the Manachasetts Irutitute of Technology have devised an auxiliary instrument that hight be termed a "fog meter". The currous device, shown above, measures the water contained in the fog. At the top of the picture may be seen a part of the hanging pipes that spouted a chemical spray in recent successful attempts to combat fog a path of clear air 2,000 feet long and 100 feet wide being produced by this means. (P.S. M. Oct., '34, p. 30)

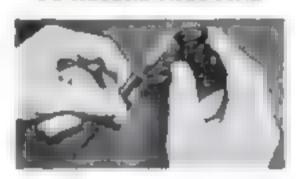
### X-RAY TUBE LOOKS LIKE A BASSOON

SHAPED like a grant musscal instrument the curtque apparatus shown at the right is actually one of the most modern types of X-ray tubes. Operating un 250 000 volts. it produces powerful and penetrating rays for deep therapy treatments. Heavily insulated cables provide the power supply and the instrument is declared to be completely shockproof It was recently placed on public view in London.



Odd view of access type X ray tube now used for deep therapy treatments

#### CLEANER STAYS IN PIPE TO ABSORB NICOTINE



An ordinary pipe cleaner, kept inside a smoking pipe of new design, serves to absorb moisture and aids in heeping the smoke sweet and clean. The smoke is drawn through an aluminum tube with a sixt bottom, through which droplets of moisture seep into a lower chamber containing the pipe cleaner. The cleaner may be removed and replaced, as shown above

## MIDGET PLANE DOES A MILE A MINUTE

Dussen the "sky flea," a midget airplane just introduced in France measures less than twenty feet between wingups. It is said to take off with a run of only 100 yards, and to fly at a speed of more than sixty miles an hour. A twenty-horsepower motor drives the tiny graft. The machine shown in the photograph is reported to have flown 4,000 miles in sucressful trials. Small planes of this type because of their low cost economy of operation and versal ity are expected to give a great impetus to aviation as a sport. They can be housed almost anywhere, and need no large landing field.



"Sky Bea" plane recently introduced in Prance. It has a wing spread of less than twenty fret



#### "ROPE TRICK" PICTURED IN CLEVER CAMERA HOAX

Has the famous Indian rope trick actually been performed? A photograph just received from England, and reproduced here, apparently abows a fakw in the very act of executing the feat. According to regend, the trick consists of throwing a rope into the air and trusing it to become rigid so that a boy can rlumb it and disappear. Skepties examining the arresting picture, however, will suspect that what masquerades as a rope is actually a rigid from shaft, upon which the boy balanced himself long enough for a cameraman to snap the picture. Professional magicians challenge anyone to perform the trick.





A c cr ch e se o w h an h Colorado fin d. Ahove
we were derabled product and the raw thater al. One
we will make the ten pounds of sugar as the sack.

# MARVELS OF CHEMISTRY BRING TO YOUR TABLE UGAR

There were enough of he me white, control roots in the mountainous pile in front of me, to lay in a double line from New York City to San Francisco, enough of them to sink the largest ocean freighter ever built. Forty thousand tons of them! A quarter of a million dollars' worth of sugar beets!

Beyond the beet mountain, housed in a structure as hig as the hanger for a giant Zeppe in another mountain was rising—a mountain of sugar, stowed in sacks. Day and night a river of beets was flowing down from the one mountain into the hig sugar factory at Brighton. Colo. Day and night, a river of sugar was flowing out of the factory, his ding the mountain in the great storehouse. In a few weeks the beet mountain would be gone, and the sugar mountain would fill the storehouse to the very roof

Of all the foods and delicacies that reach our tables, probably none has gone through such complex processes of manufacture as the little whate crystals in our sugar bowls. To follow a truck-load of beets from the time when they are plowed from the ground, until the sugar in them is extracted to flow in a snow-white avalanche into the sacks that await it, is to writess one of the most spectacular operations in modern food production.

The beet seed is panted early in the spring, as soon as the ground is warm enough to cause germination. Lake wheat and other small grains, it is drilled in rows about twenty inches apart. A few weeks after the fields are ribboned by thack stands of little plants. Now come the blockers and the thinners, A veritable

## By Frank Clay Cross

army of thousands of men and women invade the fields on hands and knees. These are the thioners. Ahead of them goes a smaller army of blockers, hoes in hand, who chop out regular intervals in the stand, leaving small bunches of plants every ten or twelve inches along each row, The thinners complete the job, pulling up every plant save one in each bunch left by the blockers.

The task of the thinners is one of the most tecsous and back-breaking drudgeries known to agriculture. Most of the workers are Mexicans. You see them moving slowly down long rows of beets, some stooping, some crawling on all fours, bardly passing as they work, bour after hour, under the hot sun.

When the fields have been thinned, they are cultivated and irrigated at intervals until the beets are ready for harvesting. They are then plowed from the ground, topped, and loaded directly into the trucks that carry them either to the factory or to the beet dumps from which they are transported to the factory by rail. For many years, inventors have sought to design some machine which would automatically cut the top off each beet as it is plowed from the ground, but thus far no satisfactory way has been found to replace the human toppers who do the job by hand with beavy, sharp knives.

I stood beside the great beet mountain

I stood beside the great best mountain at Brighton, watching the long file of trucks as they passed over the scales to be weighed and thence to the me harmal unipader. As each truck came alonguide the un under the truck beat was titled to side a terrent of ages a mo a my hopper. from which they were quickly elevated fourteen feet to the top it the beet pie It was awn inspiring to realize that every beet in that endless stream has oven throwed and topped individually by human hands. If it were passible for me to count the beets to that beet mountain at the rate of one per second, pursuing my count continuously for eight hours every day and seven days every week, there would still be beets uncounted at the end of four whole years. Yes that pile was only one of many in the West. There were six een other sugar fac ories in Colorado a one every one with a beet mountain. beside it, and many other piles were scattered through the sugar-beet country, away from the factories

Under the moun ain in front of me were numerous channels, filled with swift currents of water and so designed that they could be uncovered, section by section to a liw the bees to course down into them. The water carried them bobbing and tumbling like loops in a mill stream. Into a trash house where the beavier debris was charned and stagged out of the flood. Then they were caught up by an eleva or and lifted to the washer on the top floor of the factor.

"We'll follow them right through the plant," my guide said. So up we went to watch the beets roll out of the washer. They were as clean when they came forth as if each had been acrubbed by a fussy housewife. That was not enough, however for as they moved toward the slicers,

38



they passed under the watchful eyes of a worker whose hand flashed among them, now and then, to remove imperfect beets and occasional pieces of debris that had escaped the mechanical cleansers.

"One grab by that man may save several bundreds of dollars," my guide told me. "If a piece of wood, or a stone, gets into the slicers, the whole factory may have to stop work until repairs are made."

The sheers are cylinders lined with knives which reminded me of the vegetable shredders to be found in nearly any kitchen. When the beets emerged from them they looked much like Chinese needles. Indeed they are commonly called needles, though the proper name for them is cossettes.

We could look down, from where we stood to the floor below where the needless, dropped from the alicers, moved mong an endless conveyor above and to one side of the diffusion battery. This butery consists of fourteen big, cylindrical, from cells, each one of which will hold five and one half tons of noodles. Men, stripped to the waist, were filling one of the cells, jamming the needles into a manbole in the top of it as they poured off the conveyor. When that rell was packed full, the stream was turned into the next cell.

The operation of the diffusion bettery is one of the surprises of a beet sugar factory. You might suppose that the purce is pressed from the roots, like cluer is pressed from apples. So it was in earlier times, by now the jurce is removed by what physicists call the principle of osmosis.

You can perform a sample experiment which will show you how osmosis works. Take a long glass tube and cover one end of it with a sack, made

and see the se

A centralize to the sugar factory being filled with the miniate of crystal sugar and molasses on it count from the boilers to be separated

Workers filling a call in the diffusion barriery with heet connection, or abredded beets, to extract the juice by output the

of any minutely porous membrane. A small bladder will serve the purpose, Now the sack with thick strup and immerse it in a basin of water with the glass tuke apright and above the water. You will see the figured begin to use in the tube. Eventually it will flow out the apper end

The explanation is that when water and strup, or two sirup solutions of different density, are separated with only a posous membrane be ween them, they will diffuse through it up it solutions of equal density have been formed on both sides. If there is room for the beavier strup to expand, the water or lighter strup will diffuse into a much more rapidly than it diffuses through the membrane in the other direction. If there (Continued on page 118)

# Modern Wonder Cameras

# SEE LIKE CATS IN THE DARK

If YOU should take a sirol, through the brightly lighted area of almost any American city
after nightfall, the chances are that you would
encounter several suspicious-looking persons
carrying strange little boxes with stubby tubes projecting from them. You would see them point these
objects at thester signs, tatorabs unloading at the
curb, attractive store windows, and pedestrians
passing beneath bridiantly illuminated theater canopies. These are amsteur photographers who have
succumbed to the late of cat's-eye photography,
and find the taking of difficult hightime photographs with the wonder camerus of today an absorbing bobby

Times Square, New York, and the adjacent Broadway theater district are especially attractive to aughttime photographers because of the exceptional idumination provided by theater and other signs. Yet, even along this famous Great White Way, there are many cursous folk who are frankly puzzled by the ultra-speed cameras

The writer paused in the middle of a street one night to photograph a particularly attractive electric sign in Times Square. Out of the corner of his eye he saw a policeman hastily approaching. There was a look of currosity on his face instead of the expected stern acowl.

What are you doing there?" the officer inquired "Taking a picture," I explained. The policement grinned wise y

Go ahead. he said, "but you won't get any-

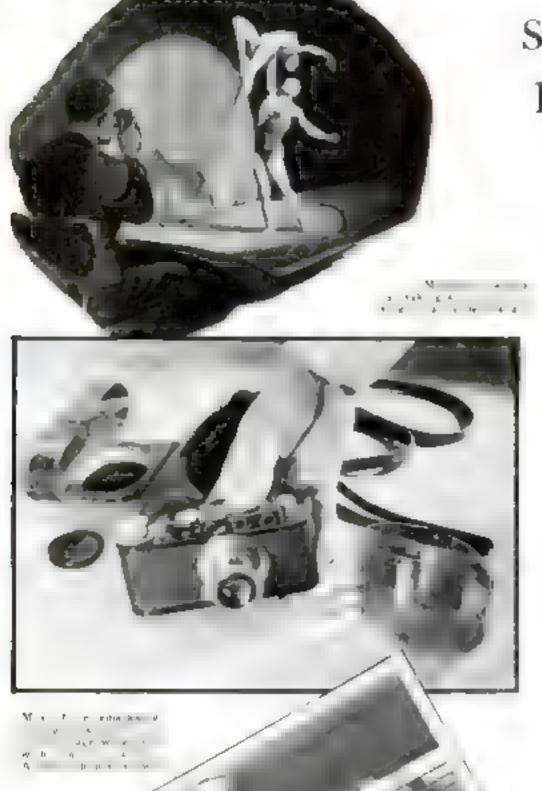
thing. There isn , enough aght

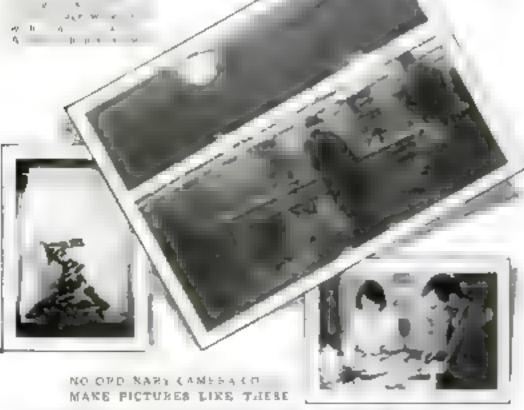
I explained to him in detail the abilities of my little camera, how it could make pictures that would have been considered impossibilities a few years ago, and how it was a close approach to the ideal instrument which can photograph anything be eve can see

Whenever a group of amateur photographers assembles, there usually is at least one high-speed manuture camera present, and a few prints are being passed around to illustrate its latest triumphs. One owner of such a camera has built up a profiable business by producing unusual action pictures of stage performances, backwage and dressing-room activities, cabaret scenes, party happenings, and

Of course, professional cameramen have not been slow in adopting the ultra-speed camera for difficult work. One large news-picture syndicate employs a man who does little else but experiment with ways of getting better pictures with the miniature cameras the staff men carry, as equipment applicate to their standard "four-by-fives." These little picture-making machines have created, in news-picture circles, a new field called candid photography because they permit making informal pictures without the subjects' being aware of the fac.

Such stars as phointraphing a stage juggler to show the Indian clubs in mid-air, or getting a picture of Greta Garbo simply by snapping the camera at a theater screen on which her image is being projected, have been made possible by the comparatively recent perfection of ultra-speed lenses.





The larger picture is a snapshot made at night by electric light in a New York Automat restaurant. The two ameties it untrations show the acroal size of contact prints made with the discretions of each purposes, the pictures are solarged.



A few years ago, a camera lens whose focal length was four and one half times its effective diameter was considered speedy. Now, however, lenses rated at F/15, which means that the focal length is only one and one half times as great as the diameter, are common. In photography, the method of stating the lens speed is to dryghate the ratio of the diameter of the opening to the focal length. The larger the diameter in relation to the focus—the smaller the ratio, in other words—the more light a lens will admit in a given praction of a second.

Lens designers can produce speedier lenses if the focus is kept small. The size of the glass elements does not become impractical, and defects inherent in all lenses can be kept to a minimum. That is why, today, an ultra-speed camera is nearly always a very small camera, one of the "minimure" types so popular among photographers. Many of these cameras use thirty-five-millimeter motion-picture film. Others employ somewhat larger roll films, film packs, cut films, or plates

Even the fastest lens that optical experta have been able to produce would be of little value in cat's-eye photography if it were not for the modern high-speed films. Because most nighttime and indoor anapahots are made by artificial light, and because such light, coming from electric amps, contains mostly red and yellow rays, nims must be sensitive to these colors. And so manufacturers have brought to a high state of perfection the so-called panchrumatic or "every-color" films and plates. Such negative materials are sensilive to the blue light that affects all other types of plates and films, but they are also sensitive to greens, yellows, and particularly reds.

Such films, even when used with ordi-

Theorem, inside and ou are favor to subjects for car a eye camera fans. A lighted sign was caught in the postura above. Right, acrobots by stage, ight

nary tumeras having comparatively slow lenses, yield remarkable results. For instance, it is entirely possible to make an acceptable portent of a person by the light of a single match. The red bight so common in darkrooms not many years ago, and still used with "color-blind" and similar plates and films, gives enough lifemination to permit photographing the darkroom interior on panchromatic film. Such film, incidentally, must be handled and developed in total darkness or by the light of a special green safetubt lamp

And so the photographer who sallies forth with a high-speed cat s-cye camera generally loads it with color-sensitive film or

plates when he is seeking aughttime subjects, or those illuminated by late-afternoon or winter daylight

The camera in which a remarkably speedy lens and a fast, color-sensitive film have joined forces to make difficult photography easy, but opened an entirely new field to photographers. There is a mysterious fascination in the making of pic tures with such a camera. In fact, this fascination has had much to do with the development of the new hobby of miniature photography

Possibilities confronting the owner of a cat s-eye camera are almost without munber. He can go to a theater and obtain interesting and unusual pictures of stage

scenes and even from the motion-picture serven, as long as he does not make a nuisance of himself by obstructing the new of other pairons. Creases offer end less possibilities, even if the comeraman cannot attend a daytime performance. The field of informal bome portraiture—snapping Junior while he is laboriously building a block castle on the mursery floor, or capturing a picture of the lady of the bousehold while she is carving a juicy raisin pie in the kitchen-is attractive because it provides priceless souvenirs which would be unobtainable by ordinary photographic means. Many restaurance are lighted brightly enough to permit the making of ex- (C memu-1 on page 13-1



#### SNOWSHOE-SHAPED RACKET MAKES TENNIS EASIER

Designed to distribute attrophysically a currous new tennis racket has more us appearance in England. The share of a frame suggests that of a snowshoe Branching arms form a "V" with a short handle at their bottom and a webbed oval for striking the ball is enclosed between them at the top. The inventor of the new racket is F W Donisthorpe, professional tennis tham p in at the fattage of 1924-1925 and an internationally famous player of the game.

## RESTORE OLD INDIAN VILLAGE



AN INDIAN VIllage supposed to be 200 years old is being restored by Civilian Conservation Corps workers near Bismarck, N. D., with the assistance of Indians of the Mandan tribe whose ancesturs inhabited the prigina, v age The earth lodges it contained, which are now being reproduced, were formed by a framework of heavy timbers, covered over with willow rods, coarse swamp hay, and finally earth and sod, Such lodges were waterproof, cool in summer and quite warm in winter



Heavy timbers of the lodge being gut into place

They ranged in size from one family homes to ceremonal ladges and lasted fifteen years or longer. Their inhabitants were a peace-loving agricultural tribe, fund of claborate ceremonsals and of tattooing for personal adornment, which caused them to become known, in such language, as "the lattooed people"

## HARD NEW ABRASIVE RIVALS DIAMONDS

Sixce the hardest material ever produced by man, named boron carbide, was introduced to industry not long ago, it has found many uses. Crystals of the new substance, called "synthetic black diamonds because their hardness approaches that of teal diamonds, are employed where only natural gems have served before. Dies of the new material have replaced diamond dies for drawing wire to great thinness bearings in electric meters and other descriptions in struments are made from buron

carbide. Its superior hardness to all other artificial abrasives has led to its wide use for cutting and lapping the new hard altoys used in modern tools

A unique property of boron carbide distinguishing it from other artificial abrasives, in that it may be melted and formed into molded shapes. Thus, high-pressure materials may be made entirely of boron carbide, without the use of any bonding material of inferior burdness. Ordinary

notales become worthless in a short time from the cutting actine of the a massive stream

heron car is a known to the reasno of octob and carbon, a has been a labora ory cartos by



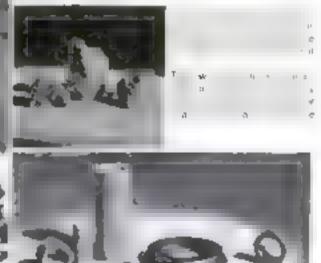
Lucamer ve turning itself under its own power

### LOCOMOTIVE'S POWER OPERATES TURNTABLE

Evolusit incomotives steaming into King's Cross Station, London, can now turn themselves around under their own power. A single-wheel tractor, geared to the turntable itself, is powered by a two-cylinder vacuum engine operated from the brake lines of the locomotive. When the engineer has run his locomotive onto the turntable, the fireman connects the vacuum brake pipe on the engine to a pipe on the tractor. The suction sets the double acting oscil ating cylinders operating



Sand bigging with a least toxic



POPULAR SCIENCE MONTHLY



The Hagen Gorks Soviet educational plane, and to be the largest land plane in the world. Right, squaway view shows attangement of interior

Newspaper Printed on Plane in Flight

AMONSTER arpeane that carries a printing plant aboard is the Soviet a latest tool to educate the masses. In flying trips to outlying districts. Named he Maxim Gorki and called the largest and plane ever built, the huge machine measures 210 feet in wing span and weighs forty-two tons when ready for flight Eight motors totaling 7,300 horsepower properled it at a speed well in excess of two miles a minute, in recent successful flight tests.

The printing plant contains all the equipment necessary for listing a complete newspaper during a flight. A reliave press designed especially for the plane prints as many as 10,000 copies an hour of an illustrated paper of twelve- by a x-cen-inch size. for distribution on landing Pictures taken during flight are prepared for the paper in a photo-mechanical laboratory aboard.

Movie shows may be given the populace by a folding acreen carried in the rear of he plane and act up on the ground so hat 10,000 spectators may view the show The movies are thrown on the screen from a projection room within the plane,



The radio tours, with its bigb-

speed equipment

PROTECTIONS

Pantengore taking estimatiments in the plane a corp cafe

The printing press abound the Maxim Garle, which turns out 10,000 copies per hour of a newspaper whole the airplane is in flight

through a window in the fase age

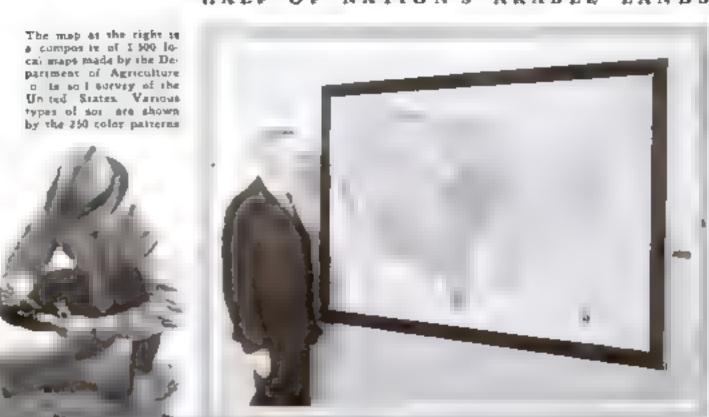
Speech and music, (rom a microphone or phonograph withth the plane, may be broadcast audibly so that they are heard by all those beneath, within an area of nearly four square miles. Other communication facilities of the plane include highspeed radio apparatus for transmitting routine cars and telegrams, and an interrommunication system aboard, a new departure in aviation. By switching a lever, the commander or navigator may address

all occupants of the plane simultaneously in order to deliver instructions, while at other times the system is used for conversations between the various calons

Lounging and sleeping cabins for seventy passengers are furnished as confortably as a hotel, and food is served from an electric kitchen during thight. An electric power plant of sufficient capacity to light more than 300 of the wait lamps, provides current

## Soil "Census" Helps Farmers

HALF OF NATION'S ARABLE LANDS



Soil surveyors treating the damp subso t for accounty flamp on brought upby an augustibe did from a depth of naveral fact are tested at once



TESTS MADE IN PIELD LABORATORY

Sciences recording the results of a kall determination test made with a secto year be day Many other tests are made by the workers in the field.

TAKING SAMPLES

At left, surveyors are making records of texture, color and density of the soil. Samples from the different land types are bagged and tagged for further examination by chemists in Washington WO hundred and fifty different color patterns bedeck a strange map of the United States that hangs upon the wall of a Washington, D. C., office, each pattern representing a particular kind of soil. The big chart is a composite of 1,500 local soil survey maps so far completed by the U.S. Department of Agriculture, which has just brought halfway to completion a monumental task it began thirty-five years ago—to survey and classify every parcel of arable land in the country, so that it may be farmed to the best possible advantage

Each of the thousands of different types of soil in the United States is best suited for certain plants. The task of the surveyors is to identify each soil type and map its occurrence; then to determine what crops will grow best upon it, and to discover how it may be improved

The first step in mapping a given area is a preliminary acousing exploration by an expert surveyor and one or more technical assistants, armed with an accurate base map of the region. Taking samples of the soil at quarter-mile intervals, they represent it on the base map by symbols such as 27° for Susquehanna fine sandy clay" and "45" for "Elkton loam."

The boundaries of each type are entered upon the base map. Meanwhile samples are taken methodically of each soil layer, to a depth of several feet, for more extended chemical analysis. These samples, together with the field maps, are forwarded to Washington.

There chemists investigate the composition of a soil by separating it into its component parts. The percentage of these constituents tells much as to the possibili-

lies of the soil

Finally, in a central drafting room, the field sheets are revised to include this combined information, and are copied. The finished local map shows the types of soil in color and indicates their boundaries with reference to roads, houses, streams, takes, and other landmarks.

## Raise Better Crops

ALREADY TESTED IN GIANT SURVEY





DIAMONDS now in circulation are valued as \$70,000,000,000. Their combined weight is half that of a modern locomotive,

(NSECTS have dialects first as humans do, A. Washington D. C. scientist reports crickets and hatydids of the same species in different parts of the country have distinguishing chirps and trills added to their common calls.

ONE HALF of the shell of a grant close is sometimes used by South See Islanders for a bath tab.



THREE METEORS an hour is the average unmber visible under ideal conditions from any given point on the earth's surface.

PISH have been caught in the Scharp Desert. Water from wells 300 feet deep brought them to the surface. It is estamed that underground repers carried them to the spot.



FIGHTING FROST with dynamite is a new method used in the Middle Hest. Intermittent blasts during the night here the air in circulation and prevent the premature frests from damaging garden crops.

TWO-WAY RAD O conversations recently took place between an operator in Sidney, Antenna, and a cruising police-type patrol car in Schenectady, N. Y.

EXAMINATION of the inner our of a fish will reveal its age, according to an Eustern artestes).



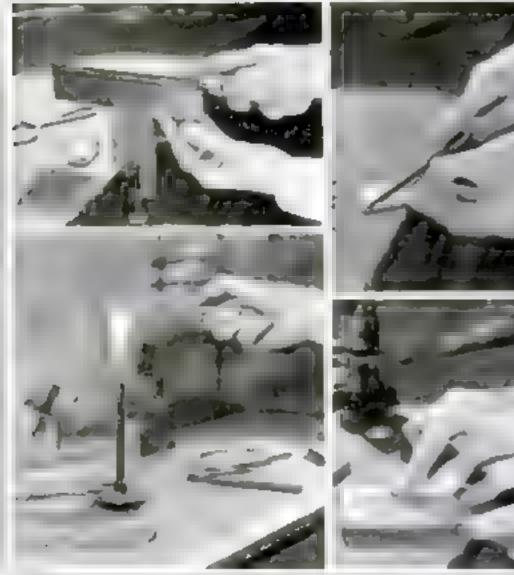
AUTOMOBILE FUMES bill an average of three Americans a day.

WARS come when the sunspots are at their maximum; hence is must common when they are at their minimum. A French astronomer has reached this courseson after comparing sunspot records with the history of the world.



# Your Microscope Reveals





- 1 The first step in preparing a bone section. The bone is all sed with a fine-toothed yaw
- 2 A drap of beliam is beated on a slide, and the piece of buse is pressed firmly into it
- 3 Set firmly on the slide, the bit of bone is 3 filed down matri at has been made very than
- After grinding to remove file marks, the T specimen is polished on a smooth savor bone

o MANY persons, the word skeleton" suggests graveyards, death, or something to be kept in the family closet, but to the owner of a microscope it indicates a vast wonderland for him to explore

Have you ever watched a man mowing grass with a scythe? He carries a whet stone in his pocket, and frequently has to sharpen the scythe blade. He may wonder why the blade dults so quickly when it is cutting norhing but soft stems. If he had a microscope, he could solve the mystery easily He would find that it is all because of sheletons.

Many plants have skeletons that are surprisingly durable and, when seen through your magic lenses, even beautiful. The epidermis or surface layer, of stems, blades, and other parts of various plants, is composed of cells whose walls are impregnated with silica (silicon dioude), one of the most abundant of materials. Similar silica deposits are found in the busks or chaff and in the stems of many grains, such as rice and wheat

One of the most extensive deposits occurs in the equisetum or "horse-tail" plant, which is commonly found along rai road embankments and is shaped somewhat like a Christmas tree. This plant size is known by various other names such as "scouring rush." It used to be a common practice to dry the equisetum plant and use it to scour pots and pans, and smooth wood. With your interescope you can see why the equisetum made so serviceable a scouring material. You will find that the entire plant is composed of glass-like silica

To convert the silica skeleton of an equiscium stem or grass blade into a benutiful object for the microscope, you must remove the organic material. Place a small quantity of concentrated in ric acid in a test tube, drop the small pieces of piant material into it, and be a it over a gas or alcohol flame taking cure to keep a off your hands and clothing. Aways hold the test tube with its mouth away from you and heat it gradually, so that the glass wilnot crack. It is a good idea to have a generous supply of some kind of alking solution handy to douse on the acid if it spills. When the acid and its contained specimens are being beated, brown fumes usually form in the take above it

After the acid has boiled for a half manute or so, set the tube asine to cool then fill it half full of water, to dilute the acid. Neutralize the acid by adding a lattle at a time, some of the a kall solution Bubbles of gas will form rapidly. When no more bubbles appear, the acid has been neutralized. Let the specimens, which are now almost entirely the silica skeletons of the plant particles, settle to the bottom of the tube. Gently pour off the solution above them, and add more clean water In this way you can remove nearly all of the obernical matter in the solution.

To transfer the fragile skeletons to a microscope slide with a length of glass tabing, hold your finger over one end of the tube, lower the other end into the test

# Beauty in Skeletons

ube until it rests directly above the macerod you desire to capture, and then remove your finger. This releases the air impresented in the glass tube, causing the solution, carrying the specimens, to be forced upward by atmospheric pressure. By putting your finger over the end of he tube again, you can lift the solution with the tube

You will find the since skeletons to be objects of great beauty, particularly if examined with dark-field illumination or by polarized light. You can trace with ease the outlines of the individual cells that made up the plant tusue. At a magnification of 400 diameters or so you can see the peculiar characteristic markings in the

wails of many of these cells. Details of the hairs, stomats (breathing pores), and other structures will be found to be perfectly preserved in crystalline mice.

You will find it entertaining to examine various specimens of plant material for their silica akeletons. Take, for an ance a bit of the buil from a yellow canary seed its silics framework presents a comparated appearance, louking like parallerows of knobilite formations interfaced with wavy lines running in parallel paths. Hairs found on the chaff-scales of most grasses are reenforced with as a

FOR sheer beauty, there are few silical formations to rival that deposited in the equiserum tossies. The epiderminor out er cell layers are especially rich in the deposit. Examine a dry specimes, and then one immersed in water or bassam. You will discover that the entire surface is covered with what appear to be the spiked ends of tiny was clubs. Along the edges and places where the epidermal layer has been folded, these knobs stand out prominently

Notice particularly the arrangement of the silica particles. A study of the specimen will reveal that there is order in the apparent confusion. Some particles seem to be arranged in parallel rows. But the most beautiful forms are produced by those that group themselves into ovals, resembing they jeweled necklaces. Here and there you can see a particularly complicated arrangement, the particles arranging themselves like a many-stranded necklace spread out in a form roughly square, with curved corners. These deposits generally occur in pairs. They mark the locations of the atomata, or breathing pores.

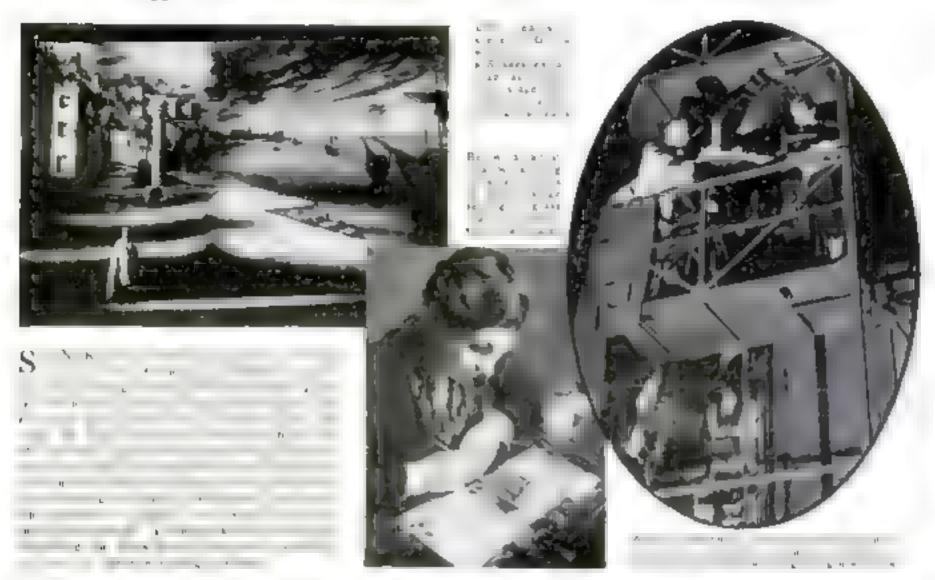
In the animal langdom, the skeleton is highly important. Insects wear theirs on the outside in the form of layers and plates of chitin, a remarkably durable substance. The shells of many sea animals serve as skeletons. Among the higher animals, the skeleton is a bony framework.

It is such bone that is to be subjected to the scrutiny of your microscope. You can use any bone that is available, although it is desirable to inspect as many different kinds as possible. Whalebone, beef bone, the bones of chickens, hors, sheep, and a host of other animals ought to be easy to obtain.

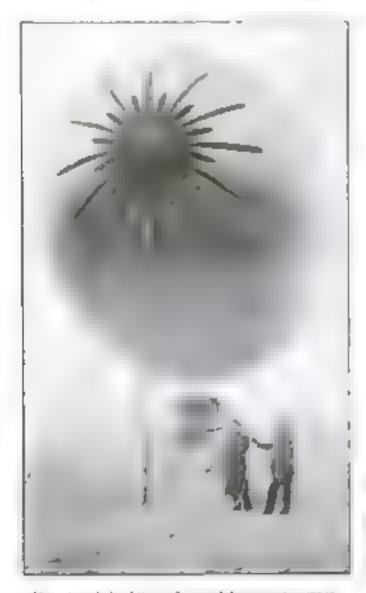
Preparing a bone for the microscope



## Magic Lantern Sets Scenes in Theater



## LITTLE DIRIGIBLE CARRIES OWN MAST



Here is a haby blimp, designed for private owner mound to its own portable and collapsible total which is said to mable it he less where is win

A ever blings that carries Is own mon ing mast is the latest creation of Anton Heinen of Lakewood, N J., in his efforts to popularize small dirigibles as privale aircraft. The mast enables the craft to and m small sirports where standard mooring facil thes are not available It is shown in use in the accompanying photograph of the blimp at Washington D C Inc. ing a recent year. Gasn ma steady the ma-





#### HARDY PLANT RESETS ITSELF

A PLANT so hardy that, if appropried by a wine form it grabs be lague wherever plants, some of the trophies of Frederal mant scientists just anck from a seven-month search in Turk, stan for crought resonant tunems of introduction have State 1 lately on as cut if an take root again and survive. Seeds of this desert grain, which is shown above, and of nearly 1 800 other plants some clime by livestock and others useful in checking soil erosing, were brought back by the explorers.

#### CAR LICENSE GLOWS AT NIGHT

Easy to read at might an automobile license plate using reflector buttons to our line the numerals is put forward by its means of combaing crime lineer the rays of a street lamp or the headlights of an approaching car the illuminated numerals glow brightly and make it easy to spot the number at an appreciable distance.



## PUTS AMERICA IN MARCH TIME

OR three hot hours of a June Satariay an excited musti ade in
Drake Stadiam, Des Moines, Iowa
watched bands from Massachusetts
Colorado, Michigan, Ohio, and Iowa contend for prizes in marching. The speciators cheered ike football fans when the
marchers joined 5,000 other boys and
jor s and closed the Eighth Annual National High-School Band Contest by a thril
ing rendition of Sousa's Stars and Stripes
Exercises.

The moment official awards were announced there was a rush to wire good or bad news to friends and relatives in communities actively interested in a contest between the pick of the 20,000 school bands which are increasing American harmony Chosen by local, state, district and national tryouts, the youthful contestants represented the best amateur performance on reed, brass and percussion instruments. They were the net results of a boom in bands which began two decades ago as an outgrowth of a boom in drum corps described in the September number of Popular Science Monthly

Drum corps date from colonial days and our first important military hand was organized shortly after the Revolution Our oldest amateur band in point of continuous existence is the Stonewall Brigade Band of Staunton, Va., organized to 1845

## By Earl Chapin May

But the myriads of pivenile school bands trace their descent from the Farm and Trades School Band organized during 1858 on Thompson a Island in Boston Harbor

Like most other amateur bands, the Boston organization was started by kids who, probably inspired by brilliant though brassy circus bands, made "music" through I save paper spread on common hair combs. These hair-cumb musicians were joined by three young violan scrapers. Later additions were a bass fidure or

TWENTY THOUSAND

American communities support school bands which are trained by experts and stimulated by colorful national tournaments. This amazing new movement, transforming the old "town band" into a crack musical organization, is described by Mr. May, who recently told of the similar boom in drum and bugle corps double bass; a saxborn (which resembled the modern alto), and a cornopear, ancestor of the modern corner

A teacher named John Ripley Morse developed this nucleus into a band which became part of a thousand-piece organization directed by the famous Pairtek S. Gilmore at the Boston Peace Jubilee of 1869. Recping pace with the times, it won first place in its class at the 1929 Massachusetts Boys' Band Contest and first prize at a subsequent New England Band Contest.

In the meanwhile American youth ran amuck with the band idea. Before our current movement for better and bigger hands for juveniles was initiated, most small-town amateur bandsmen were terrible. I know because I was one of them As a boy cornetist, aide-stepping hing trouble, I barged into leadership of the Rochelle (181.) Kid Band which grew into the Rochelle Military Band with a silver cornet painted on its bass-drum head.

We blew blue notes in instation of our elders. The local undertaker taught us gratis. The group disbanded every fall after cashing in on Fourth of July and county-fair engagements. Captions Citiens often cussed us. Less crabbed ones dropped coins into our bats and thus give us a fresh start each spring. This program was followed by most of our tooling con-

#### THE FIRST FARMERS' BAND

Right, the Page County Farmers' Band, of lows, all real farmers. Below, a diminutive bandsman with the belicon model tube, higgest of borns



temporaries. The Silver Cornet Band was countful, but it and its public suffered from lack of professional guidance and systematic sponsorahip.

Contests have taken most of the curse out of our amateur band performances. Local pride has been replaced by sensible supervision. Amateur band music has become enjoyable and cultural. Its improvement can be properly credited to the Landers Band Tax Law and the contest idea.

Major George W. Landers, of Chartena lowa started a movement in 1921 for legislation to permit minor cities to tax themselves for support of municipal hands. The law has been adopted in forty-eight states. Major Landers, wellin his seventies, is one of the few reformers who have lived to see their reforms really working

The contest idea sponsored by the

National Buseau for the Advancement of Music, the Music Educators' National Conference and finally by the National School Band Association, began in 1926 with a national band contest at Fostoria. Ohio. Ten states selected would-be champion bands by competitive eliminations. The members of each band were selected by section competitions. A section is a division composed of the same or related instruments, such as reeds or brasses.

Thirteen bands—one from as far away as Ogden, Utah—participated in that Fostoria contest. Fostoria a 10.000 citizens were hosta to the visiting band boys, who were not allowed to spend a penny in the Ohio community. The Johet, Ill., High-School Band won on performance, appearance, and marking by a fraction of a point

Joliet won again at Council Bluffs, Iowa, in 1927. In 1928, it won in its own home town, although Modesto, Calif., spent \$15,000 of publicly subscribed money to send its boys

The Joket High School Band thus gained permanent possession of the national championship trophy, and could not at tend the Denver contest of 1929 except as guest band with Director Archie Mc-Allister, its conductor, But the citizens of Johet raised the expense money, largely through seiling "Send the Band to Denver" buttons.

At Denver, the Nichous Senn High School, of Chicago, topped them all, including persistent Modesto. It repeated this performance at the 1930 Flint Mich., contest. Then Johet, permitted to reënter the arena, carried away first prise for all class-A bands at Tulsa, Ok.a.

By this time, the official National Contest had become so popular that it was becessary to classify the bands. Class A came from schools having more than 750 enrolled pupils, class B from schools having from 250 to 750; class C from schools having less than 250 enrolled pupils. By 1933, when seventy-five bands contested at Evanston II., it was necessary to substitute for "first prize" in class A an "Outstanding Band" designation. Johet got away with that one, too

Bandmaster Archie McAlaster might never have been a master of America's champion high-school band or president ex officio of the National School Band Association had it not been for his lean-



The nattily uniformed band of Manhatian College, New York City, marching past the reviewing stand in a parade. Mayor LaGuardia stands back of flag at left





THE BOY CORNETIST

The photograph below shows the author as a cornet soloist in his college days. He found born blowing an excellent preventive for lung trouble



The lungs, of course, figure in wind-instrument playing. Dr. James F Rogers, of the United States Bureau of Education, has proved by statistics based on a study of hundreds of prominent musicians who lived between 1700 and 1900, that players on wind instruments live longer than the average. In certain cases, playing the saxophone, the flute, or the cornet has definitely stayed the progress of tuberculosis. But the formation of the teeth is allimportant, for it is "longuing" and not howing, that makes a good wind-instrument player

Tone is made, primarily, on any musical instrument with a cup-shaped mouthpiece, by the tongue's attack. Hence you will never see a good bandsman puffing out his cheeks when playing. While Frank Fitzgerald was director of the Rockford. Ill., Military Band be might be the only cornetist on a march down Main Street, but you could hear him at all times above forty other instruments. He weighed less than 130 pounds, and was not barrel-chested. A dimple showed in each cheek while he played. But he got plenty of volume while hitting high C's and high E's, because he used his tongue properly and played with the "non-pressure system."

This system was then a novelty. Under it high tones were made by contracting loose lips, which thus did not become sore or grow

ing toward woodworking. Although he bought a brass cornet and started a rural hand near Jonet in his youth, he had gone into Montana fruit ranching to make a living. As an avocation he turned to woodworking. His ability in his home workshop attracted the attention of the Jewish Training Schools in Chicago, which engaged him to teach carpentering and manual training. He

Inter went to Johet to do similar work in its public schools.

Archie's first band of twelve young members rebeared in his carpenter shop. He started his first public-school band with a \$2 all awance for each rehearsal. This band was unpopularly known as "The Disease," By choosing members for loyalty, as much as ability, he began to win prizes. Then he got a real salary as director and a trip

for his band to Washington, D. C.

Archie McAllister's method with the Joliet High School Band is typical of many of his competitors. He picks his players from all classes in a city of 60,000. Solo competitions for national prizes are among the later wrinkles in high-school band contests. Leonard Bradley Jonet's solo-obos prize winner, in the son of a mail carrier, Raymond Tremmeling, who has won national prizes as a clamnetist, is the son of a street-car motorman, Robert Harris, prize-winning French-horn player, is the son of an undertaker, while Glenn Henderson, twice winner of the national prize for cornetists, is son of an electrician. And there are several farmers in that band

Jack Wainwright took Charles Monger off a farm near Fostoria and taught the boy to hold his mouthpace cosely against his lips, to breathe from the diaphragm ske a singer, to depend on his tongue for attacking a tone. In four years young Munger played a cornet solo with Sousa's Band before 20,000 visitors at the Ohio

State Fair!

Of course, the first step in selecting recruits and assigning them to instruments is to test them for tone sense. An easy method is to play a tone like C or G on a cornet or piano, then ask the pupil to sound the same tone on his instrument. If the pupil can not do this readily the teacher switches him to drains or cymbals where only a sense of time or rhythm is necessary

Assigning pupils to instruments depends largely on the teeth. If a pupil's teeth project abdormally, he is not destined for wind instruments. If upper and lower teeth overlap, they will make trouble in cornet playing. If they are large and meet evenly, they approach the ideal. If the lower teeth recede, they are almost hopeiess for any born with a small mouthpiece, which should be held at right angles from the teeth. This applies to all reed instruments except clarinets, which can be played with the bell pointing downward at an angle of thirty five degrees.



A BAND OF 1845. First members of the Stonewall Brigade Band of Staumton, Va., now the oldest amateur organization in the country

weary from "punching" and vibration, and composition of their natural blood circulation. The bands William City, Iowa, and Harrison High School, of ( s. famous band from Joliet, could not have won honors at Des Moines last June if their members have pended upon blowing into instead of tonguing if

Moderately thick lips do the best work in-meta shaped mouthpieces. Size of player and size o not necessarily associated. B. A. Rolfe, disting leader and brilliant cornetist, is notably tall a Clara Bloodgood, weighing 110 pounds, plays the exceedingly difficult "triple-tongue" solo (written origina Levy-Inthem Polka, on the Sousaphone, large instruments. And she doesn't get red in the her cheeks, authough the Sousaphone is a double B-tlat bass horn weighing thirty pounds.

double B-flat bass horn weighing thirty pounds—sometimes forty depending upon the thickness of metal tubing used.

Possibly made rusions by the amount.

Possibly made curtous by the impressive development of school bands, Prof-Carl E. Seashore of the University of lows and Prof. E.mer E. Jones of North-

western University have made elaborate laboratory tests on more than 5,000 students to determine alertness, rhythmideaterity precision, memory and coordination of brain and muscle possessed by prospective instrumentalists.

So far, most of the amateurs join bands through pure love of music. Intelligent instruction keeps them going

The Arthur, III High School has 100 pupils. Its class-C band of eighty-two members, directed by George C Wall, was creditably placed in the second cursion at the 1933 Nationa Contest. The school maintains a second or "feeder" band of twenty members,

Four years ago the Washington High School Band of Signa Falls, S. D., had practically no





Winning bands thust play classical selections with sixty or more able members and a basanced, symphonic instrumentation. Most class-A bands have 100 members

Lenoit, N. C., has a population of 4,000 and a high-school band originally apensored by the local post of the American Legion. That band started the high-school contest idea in North Carolina, as a class-B hand. It got so good it had to step up and compete, under a handicap, with class-A bands from cities ten times larger than Lenoir. But it kept winning prizes

Last year the North Carolina State Legislature made drastic cuts in school appropriations which threatened to put an end to systematic school music. The citisens of Lenour promptly voted to pay a tax to keep its band going

In addition to pointing steadily toward state and national contests, nearly all school bands hope to have representation in the National High-School Band which is instructed by eminent musicians for eight weeks each summer at Interloches, Mich. This band camp is unique

The 200 or more members of the National High-School Band are carefully selected by local music supervisors and by Dr. Joseph E. Maddy of the University of Michigan. The hand feeds into the National High-School Orchestra.

Dr. "Joe" Maddy, father of the Camp at Interlochen, believes that ten years from now each of our cities of more than 10,000 population will be supporting a genuine a American symphony orchestra. Maddy who came up from a small rown band, is not a visionary. He is supremely practical.



The seven deep throated busses of the band of the University of Southern California, grouped together for a little close harmony. This bund is distinguished by its unusual uniform, consisting of pius fours and aweaters

## Home Tests for the Amateur Scientist



HOW CLOUDS ARE MADE Place a few draps a water in a buttle and execute it of air with the lungs as shown. A flashight will seven for formed in the battle by coding due to expansion



EXPANSION OF METAL A mutal red placed as a untrated shove and heard with a match moves the cardboard pointer present at its top, thus making its a nagation visible



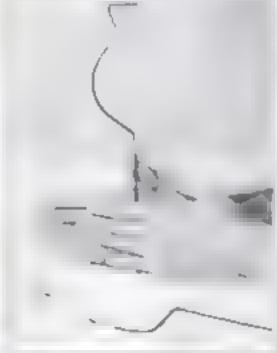
DEMONSTRATING INTERTIA A book .a.ous. pended by a string as shown above and another at my as a red be ow t. A qui is pull breaks (to lower atring thereis he dong the book to place

MAGNETISM IN WIRES A current flowing along two parallel wires connected a the units cause them to accept agels other due to magnetic fields set up. When a passes through a wire doubled back upon size I, the two order repet each other. Picture below shows set up

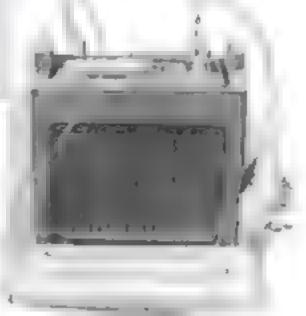
SPECTRUMONAPHONOGRAPH DISK Hold a phonograph record to that a bright light to reflexied from his surface of a wide angue and you was see the colors of the eye, raim. The grower on he disk act as a 'd fluorison graving,' and produce the eame effert as a g sas prism Suib gras ogs are comprime a used at entill ally a pique uf field prisms for breaking light into colors



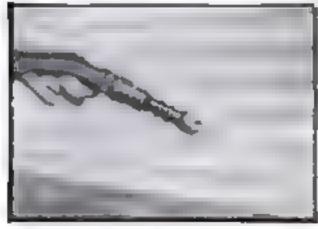
HEAT CONTRACTS RUBBER Uniter most substances, rubber contracts when heated. The band stretched as a the photograph above will shrink when heated, and sut the heavy places



PERSISTENCE OF VISION A piece of wire bent to force balf of a figure. is counted between the hands as i' untrated above. Your eye will see the figber entire because the re as of your tyr relains the image impressed upon it



A PRESSURE PARADOX When an ordinary marble is pussed against the nozale of a squarting hose, as ar the left, it will stay in place. Armosphe c pressure hosps it from being poshed away by the stream



### FIFTEEN TIME-SAVING

# HOUSEHOLD Inventions



CHILD'S EATING SET This practically unbreakable outlet will save the family chine. The dish is divided into compartments for food, and has a well for the tumb or A flenge on the edge makes it almost impossible to tip I ever



INDIVIDUAL PERCOLATOR Coffee can be percusated right in the cup with their cleve device which has a 220-wall immersion type heater in the middle of the coffee banket It may also be used as a heater for water or in the



COPPEE AS YOU LIKE IT With the nutomatic percolator shown above you can be sure of having coffee weak, med on, or already as preferred. The died is not for the strength deningd, and the automa, it control does the rest



PLEXIBLE TOASTER, This three-clice toaster will make one or two slices without wasting current, as the heaters for the empty chembers can be turned of. When toast has been made a small busting unit keeps it waston.





TOWEL RACK FOR SINE Town's are bept content untily on the handy rack, which is casely attached without tools to the briches sink and is right and permanent. A similar model is available for use on week begins of datas design.

VERSATILE KNIFE. Cutting the skin of an orange as shown, a one of the many home tasks for which this odd shaped knife is sured. Two blades on the same side adapt it for scraping paint off gives, cutting card-board, and many other purposes.

SASHLESS WINDOW Two meta-bound paper of gigs, forming the new aasbless window for homes, all de gapily on bear ngs in a weather-stripped groove. A tempered spring catch sneps to lock the window when it is closed. Photo at left shows gaventor demonstrating the use of the window with sworking model.





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N N IPB & AGE TRAY

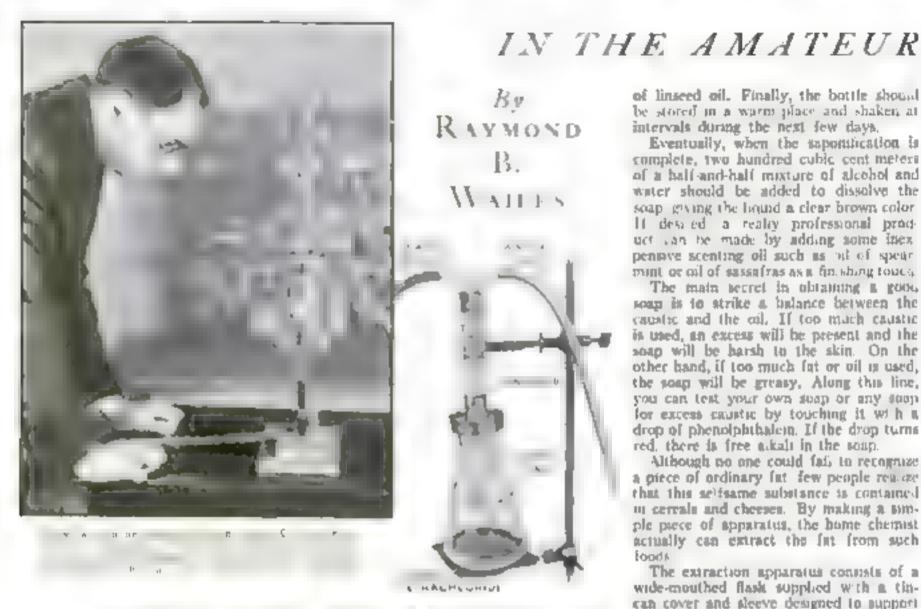
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# Experimenting with SOAP and



LONG as your home boasts a kirchen dieset voa need never look far for interesting chemical tes 4 buch hings as butter go a n cerea a, not some may be just household arrecas to the housewife but to the wide awake experimenter they represen thems als their interinto a host of important trac ins

In he chematry of supp amne your bonie appratory an provide hours of an. By not an agree simple substances that are found in every home you can make your own soap, or by making use of an inexpensive chemical you can test the commercial soaps sold by your grocer.

A though butter, linseed oil, lard, or any atty, greasy material can be used as a asis for homemade soop, the amateur will obtain better results if he spends a few cents for a bottle of olive oil. About one bandrag callic cent me as as ightig less than a half a glass) of the liquid will be enough for a fair-sized batch. Simply pour the oil into a sidiable glass container. and add a cold alkah solution made by dissolving fifteen grams of sodium bydroxide (lye will do) in one hundred cubic renameters of water,

As the materials are mixed, a curdy white precipitate will form. This reaction, continuing for two or three days, is called saponification" and results in the formation of the soap. In this case, the soap will be of the sodium-occate type and glytren also we be fortied

When the white cuted is completely pre-

pota ed a that remains is to remove he actual snap from he solution by separating it from the water. This process, known as saving, consists of adding a sourt on of about two ounces of sait dissolved in our or five hundred cutar cent meters of water. In a short time, the soap will suparate from the liquid and float at the top of the container. It may be a trafe pasty at best but if soon will lose its water as it dries. Eventually the soapcan be gathered and, after an adde onal sleving period poured into ardinard mou ds. In color the product will resemble Castile spap.

If a liquid soap is desired, cocouncil oil or linseed oil should be used. From the home chemist's stundpoint, the latter will probably he the least expensive and easiest to obtain. Thirty grams of potassium hydroxide (caustic potash) first should be dissolved in a mixture consisting of severityfive cubic centimeters of water and fifty cubic centimeters of alcobol of the grain or rubbing type. This alrobolic potash sulution then is added to about one bundred and fi y culne centameters of linseed oil. Finally, the bottle should be stored in a warm place and shaken at intervals during the next few days.

Eventually, when the aspontacation is complete, two hundred cubic cent meters of a half-and-half mixture of alcohol and water should be added to dissolve the soap giving the liquid a clear brown color. If desired a reality professional product can be made by adding some lines. penave scenting oil such as nil of spear ment or oil of sussafras as a finishing touch

The main secret in obtaining a rook. soup is to strike a balance between the caustic and the cil. If too much caustic is used, an excess will be present and the soan will be harsh to the skin. On the other hand, if too much fut or oil is used, the soap will be greasy. Along this line, you can test your own soap or any soop for excess caustic by touching it with a drop of phenolphthalem. If the drop turns red, there is free a kalt in the soup.

Although no one could fail to recognize a piece of ordinary fat few people realize. that this selfsame substance is contained or cereals and cheeses. By making a somple piece of apparatus, the home chemist actually can extract the fat from such

The extraction apparatus consists of a wide-mouthed flash supplied with a tincan cover and alceve designed to support a test tabe. Held to a vertica posit to to cold-water inlet and our et his son acts as a condenser. A piece of wire and in-U-shape and soldered to the dockers de of the cover so that its lower end extends below the fest-tube condenser serves c hord a cle h bag filled with the crushed mareral being t stee

With the test material in piace various letrachi mide is pourer into he dask, the circulating water for the condenser turned on, and heat applied. As the car on te rachloride is vaporized it rises is condensed



Butyric acid, made from butter, shows an acid reaction when dot fied and peated into an alkaline solution containing phenniphtheleid

## Other Household Chemicals

## LABORATORY

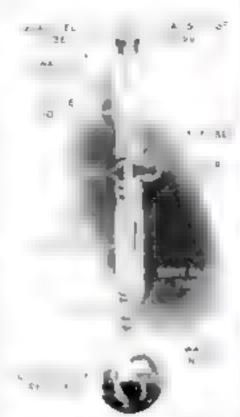
on the sides of the test tube, and drops in a steady stream onto the cloth bag. Being a good solvent for fats and oils, it dissolves any extractable material that may be present and washes it into the flask

After several bours, all of the fat contained in the material under test will be part of the solution in the flask. To reclaim it, simply store the open flask in a warm place. In time, all of the carbon tetrachloride will be vaporized, leaving the fat. If the final sociation is turbid, a preliminary filtering may be necessary before finally setting it aside

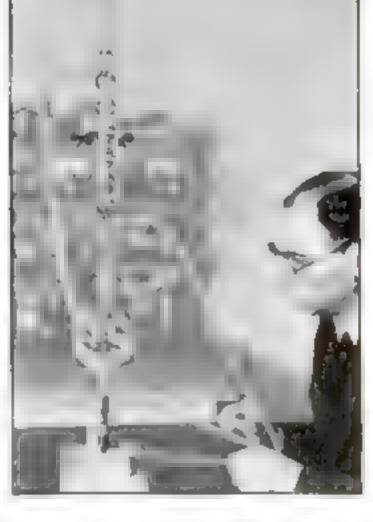
Fats liquely when gently heated, but when the temperature is raised sufficient ly they decompose. The product is an offensive and poisocous gas known as "acrolein." It is this gas that causes the eyes to amort when exposed to the dull, white vaport given off by burning, fatty

Because this gas is formed by the decomposition of the glyceride component of the fat it also can be produced by a lowing a drop or two of ordinary glycerine to fall on a hot plate; this fact makes it a simple matter for the home chemist to test automobile anti-freese solutions for the presence of glycerine

Few people would say that an acid could be made from butter, yet in the home laboratory it becomes a simple experiment. To some melted butter is a flack, add enough caustic, such as sodium hydroxide in solution, to form a scop-Then, carefully mild strong suphuric seed, a drop at a time unta the liquid gives an acid reaction by turning blue litmus paper red. This will transform the sodium butyrate, formed by the reaction between the sodium hydroxide and the melted butter



Drawing and photograph show theredown sto is compared substances

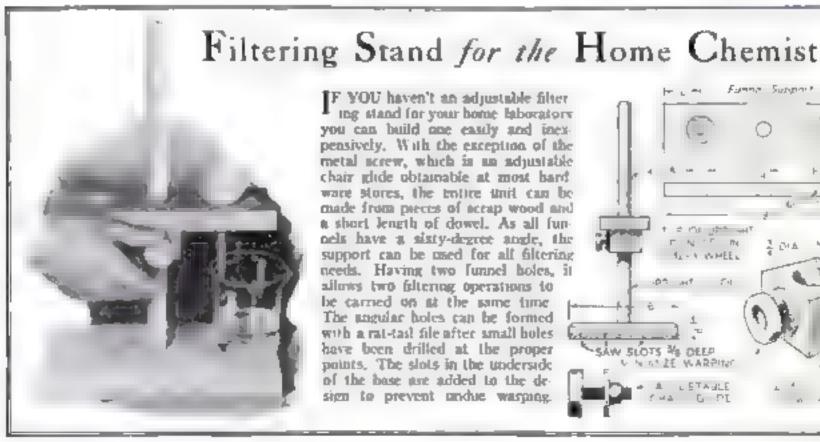


into sodium sulphate and butyric acid-Finalty, heat the mixture gently in a retort or a distribing flask. The butyra acid will distiff from the liquid, and, if allowed to pass into a weak solution of an alkali colored red by the addition of a drop of phenolphthalein, it will remove the color, indicating that an acid is pres-

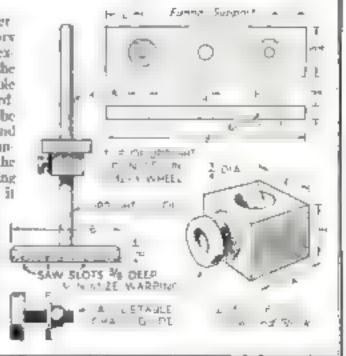
Even beef-ten cubes can be used by the home experimenter. By means of a series of simple tests he can identify the various substances used in their manuacture First of all, the cube should be placed in an evaporating dish and heated until it is almost colorless. During this process the unmistakable odor of acroicin gas will, be noticed. This indicates the presence of fat-

When it has cooled, tasting the sulstance will indicate that it is mainly salwhile a close inspection under a lens wil show the same crystal formations as those of ordinary table salt

If he desires, (Continued on page 117,



IF YOU haven't an adjustable filter ing stand for your home laboratory you can build one easily and inexpensively. With the exception of the metal screw, which is an adjustable chair glide obtainable at most bard ware stores, the cottre unit can be made from pieces of accup wood and a short length of dowel. As all funnels have a sixty-degree angle, the support can be used for all filtering needs. Having two funnel boles, it allows two filtering operations to be carried on at the same time The angular holes can be formed with a rat-tast file after small boles have been drilled at the proper points. The slots in the underside of the base are added to the design to prevent undue wasping.



Coil-Winding

HAT is the most difficult step in the construction of a simple short-wave receiver?

For that question to the average set builder and chances are be will name

average set builder and chances are be will name the chore of coil winding Yet, by following a few simple rules and bandy abort cuts, even the beginner can tarm out plug-in cuts worthy of a professional

In its simplest form a plug-in coil consists of three andividual but closely related parts—the pronged form which serves as a core for the coil as well as a means of connecting it into the a rean the small tickler and the arger gr. I wind by it ested coil spec feations are being followed, accurate values for each of these stems will be furnished. The

required diameter of the coll form will be specified in inches, the number of turns and the kind of wire indicated, and directions included for spacing the windings as were as the individual mass

Naturally the first policy to obtain surpline ories for the number of oils remared. In this sic, the amaleu can house from an amost estimated array, ranging from smooth cylaidest of fiber composition to forms of white isolantite bited with handles and convenient of disner to take the leads from each winding. Just three requirements given the choice the effective diameter of the form, the overall length of the coil and the number of connecting proofs.

Where cost is an important factor, many amateurs improvise mexpensive cold forms by making use of the romoustion bases of discarded vacuum tubes. Avaitable in diameters of one and one eighth and one and three eighths inches, and fitted with four to seven prongs, depending on the type of tube, they make ideal tool foundations.

Either of two povel methods will amplify the task of removing the glass bulb from the tube base. A hot water bath can be used to loosen the cement so that the bulb can be twisted loose or the glass envelope can be wrapped in a cloth and smashed with a blow from a hammer. In the second method, the cloth is an important safety precaution against flying glass and should not be omitted.

After most of the glass has been removed, the remainder of the cement in the base can be scraped out with a knife. Finally, the wires leading to the prongs can be toosened by touching the hot tip of a soldering from to the end of each prong and pulling the lead free with a pair of phers. Since the prongs are to be used again as connections for the winding tears on the completed coil, care must be taken not to damage them.

Although there are no rules regarding the locations of the winnings on the orms, most amareurs and it convenies. In place the gold coil at the notions nearest the prongs and the tackler above it winning them in the order named. This not only insures short sends to the prongs but also allows maximum space for the windings.

The first step in winding the coil consists of driling a small hole in the coform at a point about one quarter inchabove the bottom edge. This serves as the lead bore for the outtom end of the grid winding. The wire to be used should be threaded through it for a few toches and then wedged tightly in place with a short length of sharpened too back or match stick forced into the box.

With the end of the wire fastened



How a weight in used to provide tention in winding a coil. Buth hards are soil free in curn the collection of guide the water





The "wa king-up" method of cot winding is illustrated to the circle. The winder wastes toward the vise as the colon surred. Above the simplest way to remove a glass had been a tube base, by wrapping it in a cloth to keep glass from Bying and smashing with a barmer.

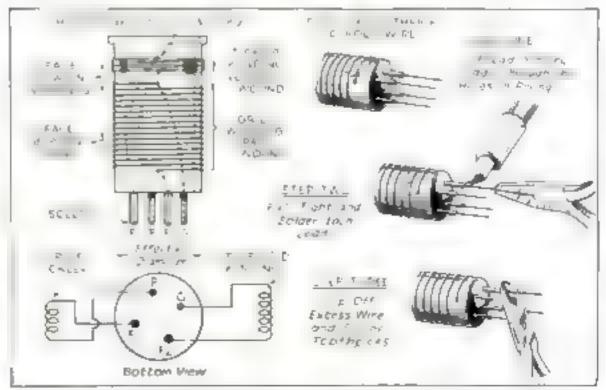


Diagram shows wiring of plug-in coil and how winding J. As are finally connected to the prongs

# Tricks for Set Builders

These Simple Yet Effective Methods Will Help You Over The Most Difficult Task In Building a Short-Wave Set

By

## GEORGE H. WALTZ, JR.

firmly, the actual winding of the coil can be accomplished in any one of a number of ways. The so-called "walking-up method consists of fastening the outer end of the wire between the jaws of a vise, holding the coil form in your hands, and walking toward the vise as the form is turned and the wire wound in place. Plenty of tension can be applied to the wire in this way and a tight winding is a most certain to resurt

Another method consists of fastening a small weight to the outer end of the wire and scapping the cuit form over a small diame er ros of wood or meta propped horizon ally in the vise to at as an axis. He had is can be used to tare he can and go be the wire which is with a winning requires an exceptionary long piece of wire, the weigh propresses.

A chiver start often used by amateurs who deare a tight was long that we before tight is that of expanding the wire before I is used by placing it is a moderately bottom of the control o

Wound on the form while expanded, and astened at its mids, its tension natural

When he find turb a ho. a wide a second base of course me second base of course me second base at least three an has of excess wave at the end of the wine but thread it through the bound find by we fee it in place with a piece of toothpick. Remember, each end of

each winding must be connected to the prongs at the base of the form, so it pays to be generous with the excess.

Just where the tickler coil is placed will depend on the distance required between the windings as given in the coil specifications. If the spacing is indicated as one eighth inch, the hole for the lower end of the tickler should be drilled exactly one eighth inch above the hole at the upper end of the grid winding. Then, when the tickler is completed a fourth hole most be drilled to take the final lead to the prongs to each case, a nothpick wedge should be used to hold the wire firmly in the hole

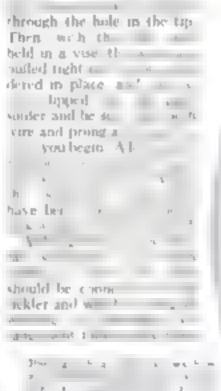
Incelentally, in drilling holes in coil forms, a small drill is not absolutely necessary. A good substitute can be made by granding or filing a brad or finishing nail to a sharp V-shaped point

Once both windings are in place and beld firmly by the touthpick wedges, all that remains is to connect the winding leads to the prongs. How this is done to shown in the sketches. Each wire is first threaded through its respectransfacturers and many amateurs is indicated in the drawing of the sample col. The letters  $F_1$  and  $F_2$ , P, and G teler to the usual filament, plate, and grid prongs on the conventional vacuum tube

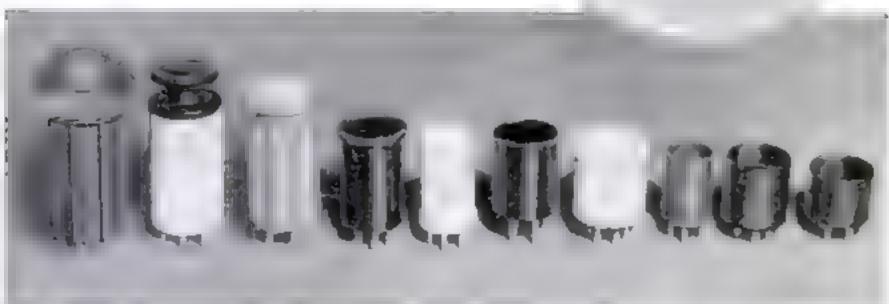
In coil winding, two general types of coils or windings can be specified—case-wound and space-wound. In a close-wound coil, as the name indicates, the turns are applied close together, while in a space-wound unit the turns are spaced from their neighbors at a specified distance. Space winding is common on short-wave cous, especially in the grid coil

Space winding can be accompushed in various ways. One simple method consists of winding a thread or cord on the coil along with the wire. If the spacing between turns is specified, a thread or cord of that diameter will space the turns just the required amount. On the other hand if the number of turns per inch instead are given, a few trials with atrings of various diameters soon will give the right spacing.

(Contented on page 4)







A few of the many types of and torses available to the smateur set builder. Note that some types are drilled for winding loads, eliminating this work

## VALUABLE HINTS FOR

## Radio Workers



## Fills Cabinet Scratches

A SIMPLE way to remove scratches from radio cabmeta is provided by a combination fider and polisher now on the market. Resembling a bullet, this inexpensive old provides a special color filler as well as a polish and removes acratches from dark and light wood aske. First, the filler crayon at one end of the handy container is rubbed over the stratch as shown above. This fills the depression, and an application of the polish from the pad at the other end completes the operation. On shallow scratches the filler can be omitted, the polish alone serving to crase the mark

## Placing the Loudspeaker

ALTHOUGH few radio owners realize it, the position of the receiver in a room has a great deal to do with its tone First of ail, it is never good practice to place the back of the receiver cabanet flush against the wall. Its rear edges should be at least an inch away from any vertical surface. If the room is long and narrow, a loudspeaker generally will give best results if it is placed at one end instead of at one of the sides. Also, if you have one favorite chair in the room, it should be in line with the speaker but not too close to it; distance lends enchantment to most laudspeaker tones. Since every room presents its own problems as far as sound is concerned, a little experimenting on the part of the amateur will be both interesting and effective.-L.J K.



New soldering-from sheath in use, abowing how the hot from is put in it

## Novel Telescoping Portable Antenna

WITH the increasing popularity of the ultra-short wave lengths comes a new type of portable and adjustable antenna especially adapted to this kind of reception. Made of close-fitting sections of duralumin tubing in the manner of a telescope, it can be collapsed or extended easily and quickly to give the best results Once the rod is in position, ingenmus slep fasteners lock the sections rigidly in place. Designed particularly for two- and one-half- and live-meter work, these antenna rods are available for either ground, airplane, or automobile stations. When mounted on a car, the rod to fastened by means of a stundy insulator to the radiator cap as illustrated in the photograph at the right. In this case, the car's body and chasis serve as a counterpoise, a clip on the radiator cap acting as the terminal.



## Neon Fuse Guards Against Excessive Voltage



## Soldering-Iron Sheath

If YOU do your radio experimenting at a kitchen table and must store your soldering from when you are not using it, the inexpensive heatproof sheath illustrated below will form a valuable addition to your tool kit. With it, there is no need to wan for the the iron to cool. Even the hottest iron, pushed into its asbestoshoed interior, can be stowed away without fear of fire. As an added advantage, the holder also is equipped with two collapsi-

ble resis that serve as a stand for the iron when it is in use. Because of its beatproof qualities, the sheath also can be used to bring an iron up to a high temperature quickly by allowing it to remain in place several minutes after the current is on.

excessive current, blowing when the amperage reaches a certain point. The recently designed mean fuses shown here however, are a prote four against excessive voltages. Besides servers to safeguard radio receivers, voltmeters, ammeters, transformers, condensers, and similar equipment against voltage surges, they also can be used to test ordinary fuses, defective resistors, or faulty condensers. In each case the excessive voltage is shunted through the fuse



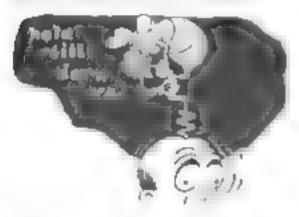
## Tool Strips Insulation

TO SIMPLIFY the problem of skinning the covering from long sections of wire, a new inexpensive insulation stripper has been developed. Suitable for all common aires of wire it consists of a U-shaped piece of spring steel bent in at the ends to form two overlapping jaws. A rasor-edge V-cut in each jaw serves to cut through the insulation, allowing it to be pulled free. To strip insulation, all that is necessary is to place the wire between the naws, close them, and pull

When were eyeglasses first invented? E. H., Omaha, Neb.



A .- arvirousit the enthest mention of the magnifying power of thaped glass appears to a book published in the eleventh tentury anrient librature tells in that the near-signant Nero held a concave emerald to his eye when watching combats in the arena



## Once Is Usually Enough

Q-is it true that a bee can stong only once, dying afterwards?-- J. O. S., Alexandria, Va

A .- No. By experimenting with all sorts of victims, an English scientist discovered recently that bees often sting several times carefully removing the stinger each time for future use. It is only when the bee is careiest and the victim violent, that the stancer is torn from the been body and left in the Worldner.

## Dynamite's Kick

Q-ix texas of pounds of biasted rock per pound of explosive, what is the blasting capacity of dynamite?-H. J. K., Buffalo, N. Y.

A.—As expent quarryman placing a two at the charge of dynamite, weighing approximately one pound in solid rock generally is sacished if four torm of broken stone are thrown loose. In earth, one pound of dynamate can be expected to throw out about one cubic yard of dirt

#### When Is A Color?

Q.-on course exist in the dark, even if we cannot see them?-R. F. A., St. Paul, Mian

A .- ALTHOUTH tolor, as we know it, is a sensation caused by reflected light of various wave lengths, our eyes are sensitive only to a limited tange of frequencies. In a space which appears dark to the eyes, there may, and do, exist many radiations outside of this bmited range. In this sense, color may be said to exist in the dark even though we do not see 4.

## Good Thing Air Is Free

R. B., parrisione, 3rp. Approximately twelve pounds of air are needed to burn one

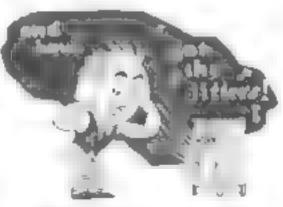
## Poison Iny's Poison

S. A. W., SALT LAKE CITY, UTAH. [ rushed]. a distant cousts of earbolic acid, has been identified as the potion in potion by, Its making this recent discovery, more than 800 toos of posson by leaves were used

### Blood and Life

Q -outs the blood die when the hear support P 5 Common Objection

A thata have shown hat the blood remane arke and germ free for at least each hours after death. As a matter of Jact. shood is now collected graded and preserved for future use in transfassions



## The Londspeakers May

Q .- ARE accentists quite sure that the thou sands of radio waves in the air have no et fect on the human body '-T Y. Tucson,

A .- acritorrat blaring loudspeakers may make us a race of pervous weeks. It is doubtful if the rudio waves themselves will have any ill effect on our bodies. So far the only influence of radio waves that has noticed is their ability to raise internal body temperatures. Fortunately, the human body can stand hundreds of times as much internal heat as that produced by even the strongest besadeasting station.

#### Densest II ater

H G. B., DETROIT, MICH. Occhrary water reaches its greatest deputy at about forty degrees Fahrenbest

## A Matter of Smell

Q-withir is a vinegarroon and how did it get its name?-W. B. K., Medford, Okla

A .- account of the vincearlike odor it emits when frightened, a species of whip scorpion has been given the nickname of "vinegar-room." The best known vinegarmon is a Mexican variety said to be extremely possonous.

## Maybe It's the Spring

Q-ox the average, do the seasons of the year have any effect on the growth of tha-dren?-- J W A., Atlanta, Ga

A.—as true result of a survey made in Europe, it is believed that children grow there rapidly during April, May, and june than during any other period in the year

## Getting Into the Air

K C., RAMINYA, CALIF. Normally, an orditary land plane must run several bundred feet before it takes off, often reaching a speed of a bundred miles an hour. The nutograspeed as low as twenty-five railes up hour,

### Radio-Minded America

L. O. D. STW YORK B. V. According to one estimate: a perox march. 9,000,000 harmer in the United States are equipped with radio, almost one third of this number having more than one set



### Rubber Tree Shoots Seeds

() -is it true that the subber tree some times makes a rapid fire noise like the contenuous papping of a machine pun?-G. W.

H. East Orange, N. J.
A. vis. The seed pods of the rubber tree. contain a gas which causes them to expende, shooting the ripened seeds seventy-five one bundred feet out into space. This is not he's method of sparing be trees. Recause of these explanators, a subbredient planta with the ten sounds ake a shooting gathery

## Gasping Just A Thirst

Q.-wary do we gasp or breathe quickly after execution or when we are startled?---

A. M., Kansas City, Mo.

A-witten we run or work, carbon dioxide toles up in our blood. We automatica versathe faster to ditute it. The same thing hardpens when we are startled. Beaut surprised or frightened we forget momentarily to breatho and the curbon dioxide accumulates to a point where we must gasp to disate it

## Race of the Century

E. W. H., PHIPPOLYCE, R. L. The cheetah, or bunting iropard and the antel pe stare the speed honors in the animal amedion. The topspeed of a fast antelope for short distances has been relatested as sixty miles an hour

## Good News for Fat Men

R. B., roston, Mass. According to a recent study made of a group of English aviation students, overweight young men have, on the average, more (Continued on page 122) For a moment the spuried sheed. The sauddenly in the speed. That a subserve the way," and Withers



## When Your Motor Misses

ahead Cy Withers noted his car not from behind a large hus and stepped on the gas. For a moment, the car spurted shead. Then, suddenly, as if bucking a strong wind, it healtated and lost speed. Withers turned to Gus Wilson, who was riding beside him,

Now do you see what I mean?" he grumbled. That a naways the way At low species, she's awell but as soon as I step on it to pass something, she dies on her feet."

thus rubbed the stabble on his dain thoughtfully. "Let's try it again," be suggested. "Only don't step on it so hard, and when she begins to lose speed let up on the accelerator for a second or so."

W there nosed out of line for another try. This time, by feeding the gas in sports, he did manage to pass the bus, but only after a tight squeeze with a loaded truck going in the opposite direction

"Phew?" exclaimed Gus, nervously \\
Little better, but none too good at that Suppose you pull over to the side of the read, and we'll take a look under the hoost.

"Could the spark piugs have anything to do with it?" Withers put in a few numites later, as Gus ran his skilled fingers over the various rods and pipes that sprouted from the carburetor

"They could, but I've got a hunch it's something else this time. There's a heap of things besides spark place that can make a motor mist." Working as he talked, the veteran mechanic went over the motor from alens to stern. Everything from the distributor to the vacuum tank came in for its share of attention.

"New heater?" he asked suddenly parting two hose connections that led through the cowl wall.

Withers nodded. "Put it in myself

## By MARTIN BUNN

about three months ago," he declared

"Well, you made a fine Job of the heater, but you certainly messed up the vacuum tank?"

"Messed up the vacuum tank?" Withers echoed, peering over Gus's broad shoulders. "I never even touched it "
"Maybe not," Gus replied. "But you

"Maybe not," Gus replied. "But you sure put a swell kink in this pipe that runs from your make maintoid to the top of the values tank. Got a roll of the tape in your soil kit.

After several minutes of rummaging Withers emerged hooding a small black rod, true stripped off several feet and proceeded to wrap it around the sharp bend in the small pine. There he granted, pressing the end of the tape in place. Now suppose we try her again and see what happens."

Mark to Webers suppose the cir

GUS says:

Using your clutch pedal as a foot rest when your editing is bad business. It puts a heap of extra wear on the clutch. The Inction surfaces that act as the connecting bak between your motor and rear end have enough to do without giving them extra wear unnecessarily. And that goes for the trick of holding your clutch down while you're waiting for the right to change too.

seemed peppier as it gained speed. At forty miles an hour, the motor stall ran smoothly and as the speedumeter climbed in furly five and then on a lafty a broad, satisfied gran beamed a ross Gas W. son a face.

Well, that sure turned the trick." agreed We here as the two men started the trip back to the Model Garage, "But I still don't see why bandaging that pipe made so much difference."

Ever try to suck water through a leaky straw?" asked Ges. "That's what your motor was trying to do, only the leaky straw was the manifold suction pipe that puts the vacuum in your vacuum tank, and the water was gasoline. When you tried to make room for those heater connections, you must have bent the suction pipe and cracked it. Naturally, air leaked in, spoiled the suction, and cut down the vacuum in the vacuum tank.

"At low speed, the leak didn't make much difference. The intake manifold developed plenty of suction, and the motor didn't need much gas. At high speed, though, it was different. Your motor needed plenty of gas, the manifold suction was less, and the leak cut down the nuclion just enough so that the supply of gas in the vacuum tank couldn't keep up with the demand."

By this time, the car had reached the Model Garage, and Gus directed Withers into the repair shop.

"You know" Gus mused, as he started to work putting in a new length of pipe, It s a funny thing about this garage business. John seem to run in bunches. This is the third gas-feed job I've had thus week, and the second one that's had something to do with the vacuum tank.

Monday morning, a fellow came in here all in a huff. Seems he'd been having trouble with his vacuum tank. Around the ally it was fine. (Continued on page 122)



## MAKING

# Colorful Modern Rings

TOOTHBRUSH HANDLES

FROM OLD

Prov typical vings made by the author from scrape of cell atc. d. week a few sola

that did not cost a dollar

By F. L. Nosvosatka

QDERN-looking tings and other costame jewelry of unusual beauty can be made entiry by band from old toothbrush handles, rousta, umbreda handles, work en's hand-bag handles and clasps, bothroom soap boxes, toothbrush holders and boxes, cells oid buttons and helt buckles. or any other such articles

If discarded materials are not at hand, a supply can be obtained at any five-andlen-cent store, or scrap celluloid in varinus thicknesses and countless color combinations may be bought by the pound from dealers and manufacturers. It is known under many trade names, usually ending in "old," "ine " or "ite," but the term "celluloid" is loosely applied to the ent re group of synthetic plastics. They all have the same general characteristics, being bard, light in weight, tough but elusit and moderate in cost

Heated to the boiling point of water celluroid becomes iterable, it can be turned carved, or ground, polished, bent, and pressed stamped, molded, or blown It is. indeed, one of the most convenient plasties to work with. Only the fact that it is in flammable can be regarded as unfavorable

Now, if you have found an old toothbrush handle of appropriate color, let's try to put it around your finger as an ornamentaland decidely unique-ring. You can create your own design as you go along so do not feel that you must follow directions slavship. The author has made and sold hundreds of rings, but rarely two alike

For a man's ring, cut the handle 3 in long for a lady's ring, 21/2 in, long Place



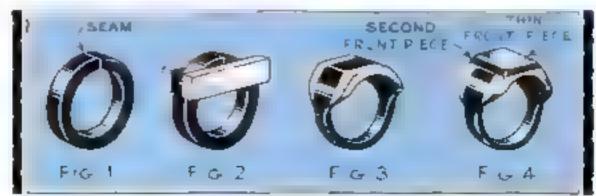
The toothbrush kundle a cut off filed flat and square solvened in horizing water bent round, and pemented at the joint with account

the piece in a small vise and file the avalshaped edges flat and even on both top and bottom, then file both sides smooth. Soften the handle in a pan of boiling water for five minutes, and bring the two ends together under water as in Fig. 1 with lender-pointed phers or tweezers, Remove from the water and scal the seam at the ends with several drops of acctone put on with an eye dropper. Let it stand for half an hour until the arctone weids the ends together

Take and her toothbrush has lie of a harmoniang or contrasting shade, file down the rounded edges, tops and bottoms unsmooth time cut two percent about I in long ann. wele and a titlerk File ad siles to a smooth sortace and sea the pieces onto the ring (shank) with acctone as n F g 2 Let stand for one hour hen shave off any protrading e lges on he top and sides with a fine-bladed coming saw as illustrated in Fig. 3. Use a smooth file to finish the sawed parts to the shape deared and to complete amouthness.

A strip of thin celluloid may be put un the front of the ring, if desired, as shown in Fig. 4, and another layer of contrasting color on top of the first front piece, giving a (wo-foned top. It le this top down after he acetone has taken effect and dried. I hish all edges and sides in any way preferred—

After the ring (Continued on page 96).



Method of making a ring from a prip of callulaid with thinner places added. The scam in kept in front so that it can hardly be desected. Endless designs may be worked out in this manner

# Recording

CCORDING to the old adage, a watched kettle never boils. On the other hand, an unwatched ket te not only bods, but generally name over and often spoils the cooking. In the same way the amateur weather observer often finds that his anemometer is becalmed and registers sero during his ensure hours, when observation is possible, and cavorts in entertaining gales during working or steeping time. Consequently a recording drum is desirable as time only cha is the behavior of the wind continuously over a period of hours, but offers a means of comparing records

from day to day and year to year,

The recording apparatus illustrated was designed for the anemometer described in a previous issue (P.S.M., Jan. '35, p. 64). Once the principle of construction is understood, any reasonably ingenious mechanic can adapt the design to suit almost any type of meteorological or other apparatus he wishes to equip with a record ing drum. The cost o materials is nom on. What are mainty required are patience and careful workmanship. With these anyone can make a from that will give a record sufficiently accurate for most amateur scientific work.

Base. Use well-painted plywood.

Dram. Saw out two three-ply disks and two rings. Mount 1-in block on faceplate, turn and face it; screw end disks to it for turning. Glue and brad rings to disks Turn profiles as detailed, with accurate center holes Paint the insides.

Turn wooden manage. Drive on drum ends. Center.



## KEEPING TABS ON THE WEATHER

HERE'S a hobby for you! It is endlessly fearmer ing, does not take much time or attention, costs little, requires no great meclanical skill or scientific ability, has lots of variety forms a good subject for conversation, serves a useful purpose and grows steadily more interesting through the years. Where can you match that combination?

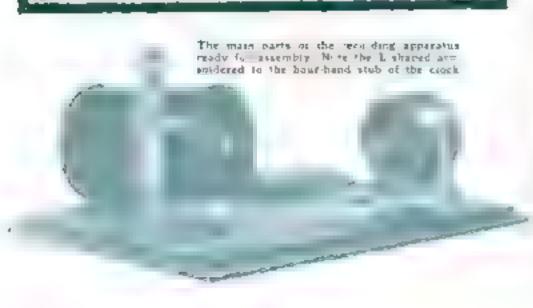
Many readers are already aware of this. When we pubhabed an announcement in the January more headed. Set up a Little Weather H read of Your Own," the tesponse and amazing. Letters and post cards was immed ste by the hundreds poured in and are continuing to do so.

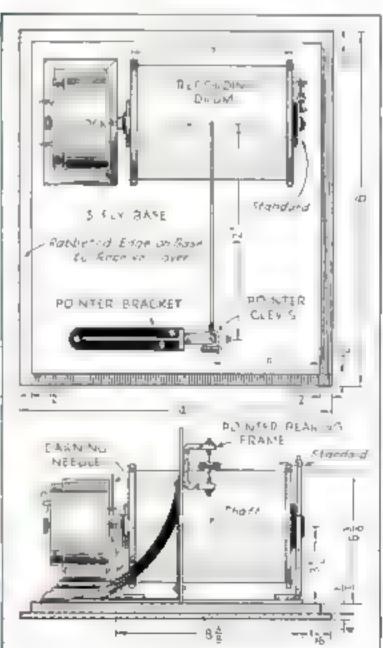
What do you need to statt this hobt y? Nothing more than a thermometer barometer and hygrometer of unqueshoned accuracy. These instruments must be good, the product of a manufacture of absolute reliability. In addi on, il you ake to make things yourself you can conprojet Various supplementary instruments and equipment Weather many can easily be obtained in fact, they are published daily in some of the larget privapapers. Hooks on how to me the must mente and how to read the clouds and other natural weather indicators are available everywhere

We consol answer individually all the letters received. but we will publish articles on the various subjects suggested in the order of their importance. Here are two typical letters.

It gave me a thrill to discover in your January Iwas the article on "Making a Wind former." I have been looking for this material for some some up to use the term to be find a Time of the part o countries of the state of the s

formula depute baye or action on horse and a real man pour and meaning the most of the arms of the arm





### TELLS HOW TO MAKE A LOW-COST

# Drum for Weather Instruments

It will keep a never-sleeping eye on your wind gauge . . . Can be adapted to other uses

manurel again in lathe. Rip twenty-six pine strips is by 5% in 61/2 in long Tack four temporarily to shenthing rings 90 deg, apart. See that drum ends are scuare with mandrel. Give on all strips at ends and edges, removing temporary braces as they are reached. Bind with string at each end. Fall joints with glue and sawdust.

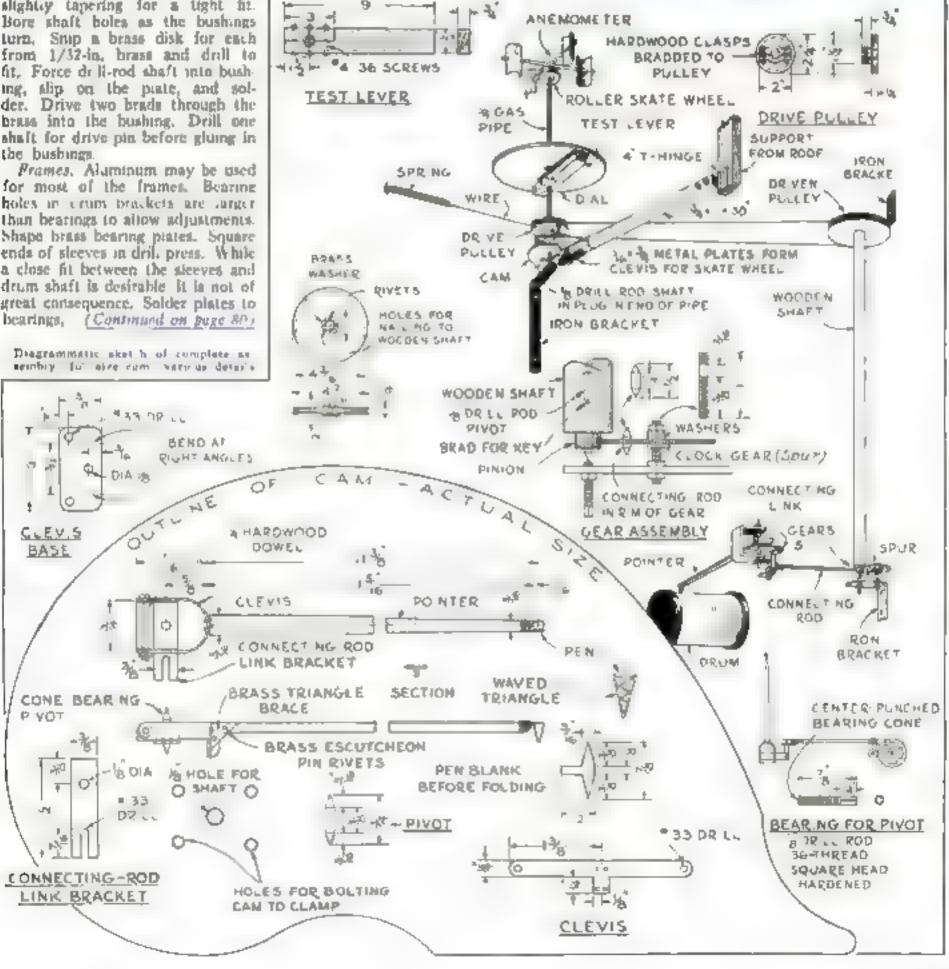
When dry, turn and sand drum round and to accurate circumference of 16 in. After painting, smooth

again and test for size. Bush holes in ends with flanged buttons turned slightly tapering for a tight fit. fit. Force de li-rod shaft into bushing, slip on the pute, and solder. Drive two brads through the the bushings.

than bearings to allow adjustments. Shape brass bearing plates. Square ends of sleeves in dril, press. While a close fit between the sieeves and drum shaft is desirable it is not of great consequence. Solder plates to

As the anemometer terms, its motion is transmitted down, as [Huntrated in the pempective drawing below. and tarner the para so trace a siguag record





## STORM SASH SERVES AS

## Window Greenhouse



FFITTED with a storm each, any window, but preferably one with a southern exposure, may be converted into a miniature greenhouse. One by twelve inch boards form the sides and bottom of the house while the storm each timed out at the bottom, completes the inclosure

The room within is not obstructed, and the plants may be readily watered through the window. By leaving the window open a little top and bottom in severy weather damage from freezing is prevented. With the window closed a high degree of his maintained, which with the good daylight offorded gives local conditions for plant growth.—W. DER, Chaistie.





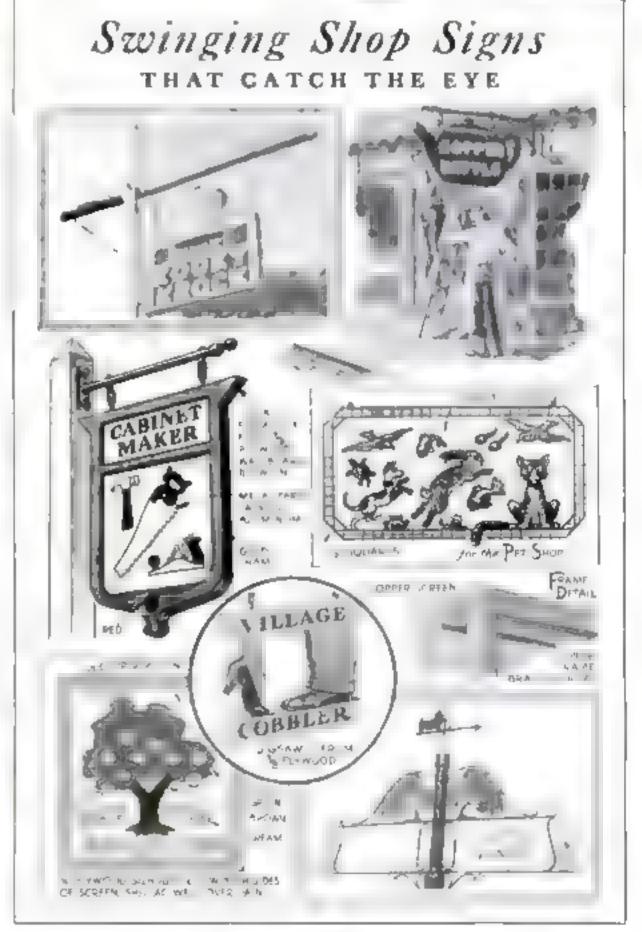
The framework against which the atorio such reacts and, above, the greenhouse from insule

### HOW TO MOUNT MINERAL SPECIMENS ON GLASS

Orbits are glass furniture cups sold for use as easters in hardware and bye-and-ten-cent stores, make attractive and in-expensive bases for mounting mineral specimens. Planter of Paris about be poured into the cup until nearly full, and the mineral or other specimen pressed into the plaster and supported until the plaste sets and holds it permanently in position.

If desired, a label bearing the specimen name and other data may be gloed to the front of the glass base.—L. C. PELTER





## Ingenious Three-in-One Table

XI SUAL on design and light and compact in construction his combination table can be converted assaults from a becased stand into a bed table, and it may also be used outside the bedroom when desired as a calor coffee table. It should therefore find ready use in any home.

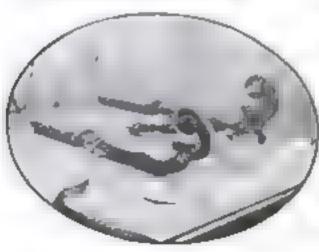
A careful study of the illustrations will reveal that this unique piece of furniture, far from being as complicated as it looks, is really easy to make. As parts may be fashioned by hand if necessary, although a small power shaper can be used to advantage for molding the edges of the top and legs. The design of the legs could be modified in various ways, lakewise, a more interesting form might be given to the rangs of it is possible to turn them on a rathe

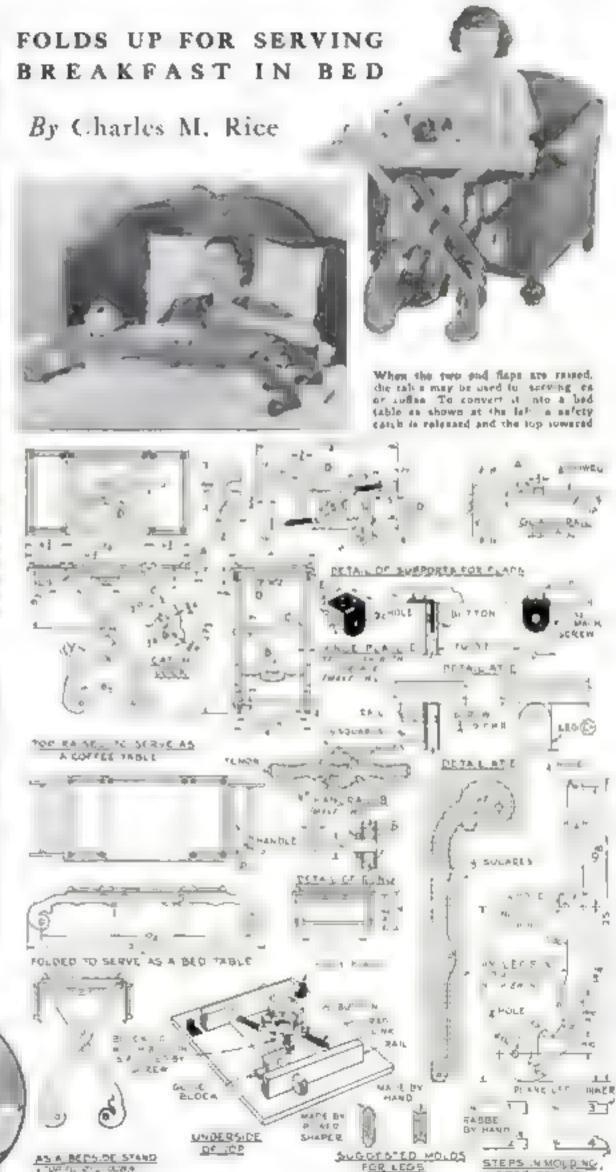
The stock used for the top, legs, and handrails is 1/2-in, five-ply wood, with hard wood on two sides. The patterns should be worked out carefully before construction work is started to assure the best results and avoid wave of meterns. It will be noted that the legs are made in pairs, one pair having a plate hole in each leg at the center, while in the other pair the hole in each leg as shown in the photograph below.

Buttonmolds may be used to cover the raw ends of he rangs if no lathe is available. The hinges and hinger plates should be set flush with the lower surface of the top. The safety calch which hocks under he center rang is very important for keeping the table rigid when in an upright position.

When the table is ready for the finish, one set of legs may be detached in order to get at the surface more read, v. The finish may vary according to individual taste and the character of the materials used.

The completed table should be kept in an accessible place so the direct become to picked up and carried where needed. Perhaps its best permanent use is as a bedside mane. When needed for a bed table it is hen necessary only to release the safety catch and lower the stand to a horizontal position by grasping the two handrails. When a coffee or tea table is needed and the table is again in its vertical position, reach down and turn the button beneath the top. This pushes out supports D, the slightly rounded ends of which pushe the end flaps to rise





The essembled table as used for a coffee table, a bed table, and a bedeide stand details of the parts, and a sketch of the flay-raising mechanism. At left. The legs are made in parts

## THIS ISSUE A New Trading

Designed by Captain E. Armitage McCann to record a rapidly vanishing type of vessel

Three two sketches, another on the facing page, and a Jourch on page 107 were made from photos of the L. A. R. mpage to above a typical Great Lakes achieves

N RESPONSE to many requests for a trading schooner model, we are illustrating, complete in this more, the Lines, sail plan, and some details for a versel of that kind.

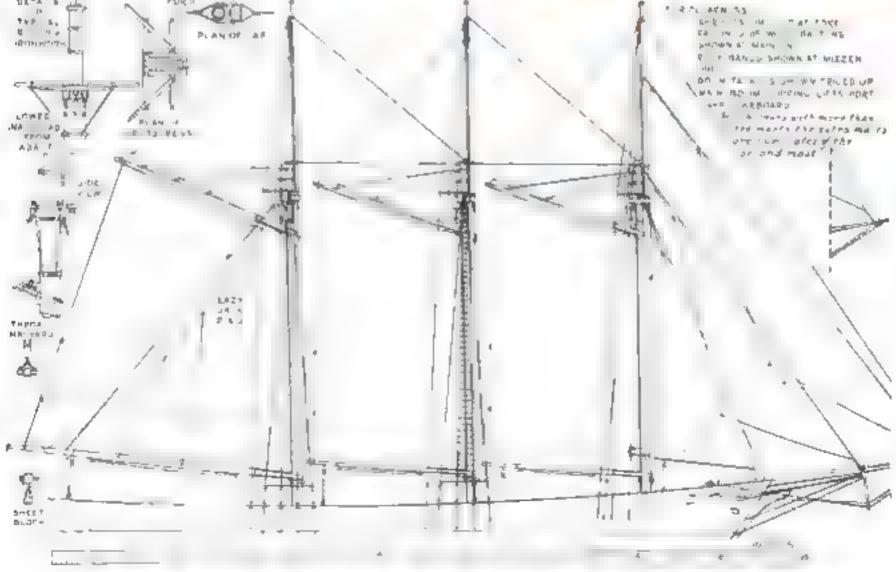
There are of course, various schoonerrigged vessels, which may be roughly classif ed as schooner yachts, fishing schooners, and trading schooners. Of these each one varies from the other. They may be large or small and have from two to, in one mstance seven masts. Some have sails only others are fitted with auxiliary en-

In build, certain schooners have flush decks (on one level) fore and aft. with or without deck houses some have a poon forecastle, and main deck others, as in our plan, have

a rong quarter-deck and well-deck forward, with skylights and all accommodatrates below

Schooners are built differen y in varous parts of the country. The West Coast. Great Lakes and Down East, have the r own general characteristics. Some are heavily built with clipper bows and stern heavy catheads, and resemble clipper ships except for the sail plan. The West Coast appear to be, on the average, the largest and heaviest, the Great Lakes schooners next, and the East Coast smallest. These factors are, of course, governed by the





Schooner Model

cargoes they are intended to carey-lumher from ore, cement, bricks, or coal.

Our schooner is of the Maine type. More schooners, but not the largest, have been built at Maine ports than elsewhere, yet they are becoming scarce because of the difficulty of finding cargoes for them. They can carry goods more cheaply than the steamers, but are not so certain in their date of delivery. The last little boom they had was carrying lumber from the West Coast to Florida during the building boom. The Lyman M. Davis, said to be the last of the Lake schooners, has recently been broken up.

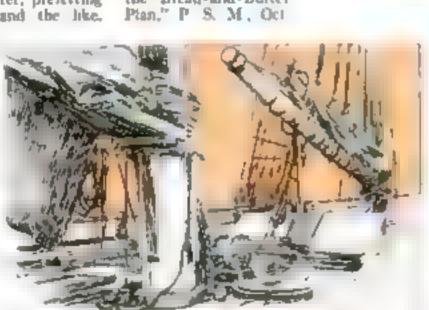
Other countries have been less inclined to favor this type of coaster, preferring topsoil schooners, brigs, and the like.

Here, however, there have been great fleets of them, particularly on the East Coast, carrying passengers and every conceivable kind of cargo in and out of all ports, large and small.

Trading schoolers vary in size from under 100 ft in length to 395 It in the case of the T II Lawson. The favorite size was from 150 to 200 ft We have chosen one 128 ft. long by 28 ft. beam, because a great many of about this size have been built. Such a length makes a good-sized model for

building on the scale of 1/6 in, equals 1 ft. Three masts are the usual rig for a vessel of this length.

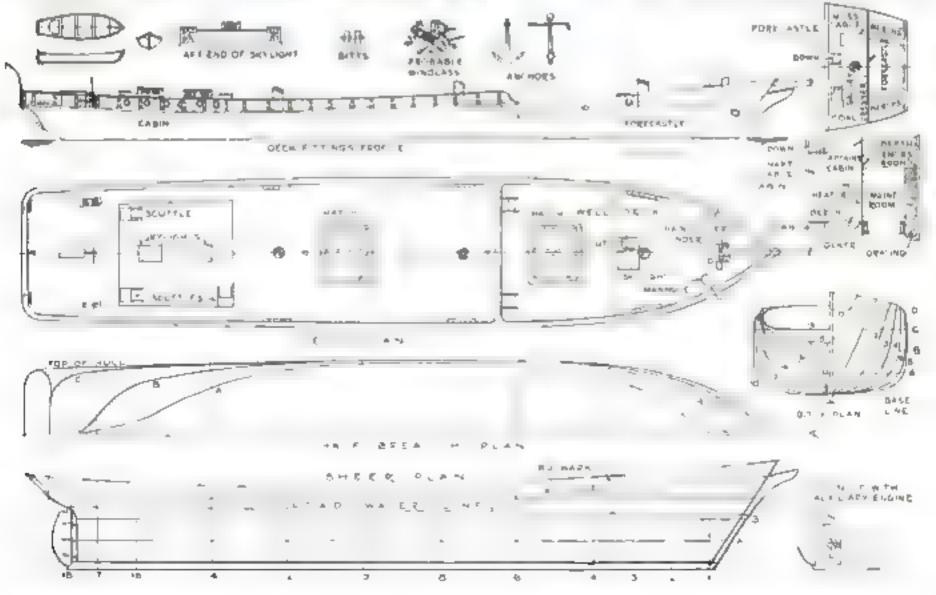
Any reader who has not previously made a half of this general type can build it by following he instructions for various models previously described to Popular Science Monthly (See especially "How I Build Ship Model Hulls on the Bread-and-Builter Plan." P. S. M., Oct.



Deck view on board the L. A. Sempuen Our model differs to some extent in design, but try to make the details look as real

'33, p. 68.) Half-inch lifts, or water lines, are shown, but any other thickness can be used by redrafting the half-breadth pine from the body plan

I suggest making the bull right up to the top line of the sheet plan and then cutting down the well deck and fitting the bulwarks. It would perhaps make an even better-looking half if one left it Rush fore-and aft, with a rail, as aft right around and raised the forward skyight and other fittings to that level but with the bow sprit, of course, below the deck, and the bawse piper lengthened. The windless is as shown on the designer's plans, but I believe the model should have a more efficient windless, (Continued on page 107)



The plans above and on the facing page are for a model of a Maine type achooner about 22% in, long over all. Use the each scale for hading dimensions

## FRANKLIN H. GOTTSHALL designs a

# Chippendale Stool

FOR YOUR LIVING ROOM



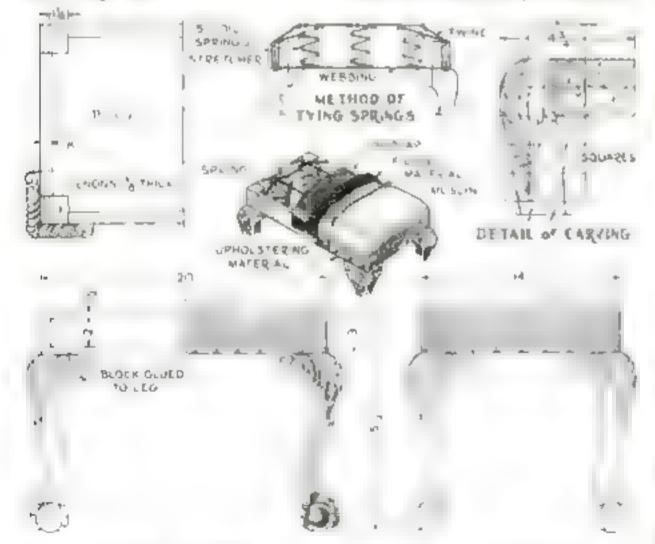
By making this graceful stook, the ameteur con practice both carving and upholetering without spending much for materials

ESIGNED in Chippendale style this stool is general enough to be used in a richly lumished living room. It will serve as a comfortable seat but in especially intended to be placed in front of a wing chair, such as the one described in a previous article (P. S. M. Dec. 134, p. 68)

Use mahogany for the legs, but the stretchers may be made of hard pine

To upholster the stool tack webbing to the hottum of the seat feame Two strips lengthwise and three crosswise will suffice. Sew six 5-in, springs to the webbing where it is crossed, and the these to the frame as shown. The springs should not be compressed by the tying. After the springs have been tied. cover them with a good grade of burlap to prevent the filling material from going through the sent Spread the filling material (either curled bair or moss) evenly in a layer about 2 in, thick, allowing it to bang over the sides as shown. Sew a few stitches through the filling material

Next cover the filling material with muslin tacking it as shown. A layer of cution felt may be placed under the musin, on top of the sent, if desired. This will help to make the sent smoother Finally cover the sent with the upholstering material, tacking it with brass-headed upholstering nails



FRONT ELEVATION

END ELEVATION

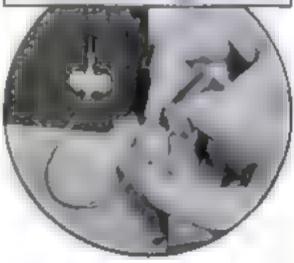
Drawings of the atsembled stool, how to lay out the carving, and method of triang the springs and applying the upbulstery. The legs are mahogany, but the rails may be a less costly wood



### **RACK TO HOLD DRAWINGS**

DEARTSMEN aften have to work in temporary quarters where there is no convenient place for rolled-up bineprints, detail sketches, and other reference material. A rack for this purpose can be made in a few minutes as shown above.—] D.G.





## FITTING A SELF-TIMER TO A BOX CAMERA

Even if you have only a box camera, you can attach a standard self-timer to it as shown above and thus be able to get into a group photograph yourself. Besides the timer, you will need a cable shutter release. Mount the cable re-ease as shown with a small bracket of this aluminum or other sintable sheet metal. This is riveted directly under the box-camera shutter release. The nelf-timer is slipped on the other end of the cable release.

Each time this device is to be used, the chatter trigger must be in the "down" position. If it is in the "up" position, set it while holding a hand over the lens so that no light can enter as the shutter opens.—George S. Greeve



Members of the St. Joseph Homeworkshop Club of St. Joseph. Ma 11 started with fifteen membere last October and now has grown to forty

Opt. and Magazine
Profess R VC (EV) F

Mr. VTH L



# Last Gall for the

# GREAT \$2,000 GUILD CONTEST

Home Workshop Clubs Push Final Preparations for National Handierast Exhibition in March

RollTS are burning late to the home workshops of hundre is of mempert of the National Homeworkshop Canh, as bey art in a shape their energy or he first National Each bition and Confest to be he I in Chicago. March 2 to 30. They are spurred on by he hape of wanting one of he thirty eight prises-\$2,000 in cash and ten silver cups and trophies—er her for themselves or for their local clu is

The or est is going to se much larger than sen the obscers of he teads and suced when I was red phonon in the Augus, and same of Popt at Sens & Martin become bing the min has grown rapidly since then. At that time there were mnety-six clubs, which was regarded as a large number and a remark aute record to be estamaked in aboueight months. Now, however, there are , 15 clam.

Another factor, of course is the liber-

ality of the prizes. The locapato to the National Home workshop Guild by its adviales are nominal and hardly do mon hap cover per age and command which having and a three sections and a diatinna exhibition out to smak of prizes. A mostly rich sponsors came -rwite how yer and are contraction prices for time existings a the on-ST PERSON STREET VINTER 16 donoring be grant sweepstake part and also hearing the administrative expenses of the show Not one cent therefore is to or taxed against the local cabs for this great event and there wit he no entry fees

Some local ab memoraare also putting special charg-



awarded with \$100 for he heat furniture made with power-driven tools.

no this show because they r a ize shat their work will be sector displayed and lary wil-, so have a set or chance to win a prize, in this first exhiartises but do not take a me-As the Guild grows, compeintens will become at fier and there will be more entries There is rurely a contest of A R to and or am y no na canal contest in worth the number of prizes is so large in proportion to the probable number of entries. In short cryone's chancer of winareg are good, and, win ur lose, club members know that their exhibits wil be well dis-

at good craftsmanshr How many opines there. will be cannot be er mated at this time because only a few clubs have definitely reported the number they ex-

mayed and viewel by a gecrew to a men who approach

(Continued on has we



Ch d's play house gives as prins by Elmburnt (III.) Homeworkshop C ub at stage show to finance toy repair transfer to

#### The CONTEST at a GLANCE

and March and in Chipago 18. And the theory without his and at 1.2. No his War a rest his term to make the first term to the t

I was a his fermion examines and of a man hip our et of the limited haves in a chandle council not with the non-industrial

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or to go to who was highly	1 6/61	"'ur and		Special Statemen Account New York

# Homemade Darkroom Clock

HAS LARGE DIAL MARKED WITH LUMINOUS PAIN I FOR READING AT A DISTANCE... WILL NOT FOG SUPERSENSITIVE FILMS By Dudley W. Read

PRE IS A DELIBORS T lock that wim, yet it can be read appomately 5 ft. away in core darley sa. It can be used for the right her I on development or the exposure of enlargementa or contac-

The only parts required for motion or an inexpensive electric clock, a slof olack Bristo, board, a bottle of care p. int, several calendars from which to cusarable figures, and a few procedutions tems such as sooler and a small piece o I in theel alcomam. If a thin enough sheet of all re min cannot easily to t need, you may use a heavy candy wratper of the slamman-foil type. This will be heavy enough.

Cut the Bristol board 12 in, square, With n pair of dividers or compasses, draw two circles, one 10 m. in diameter, the other 3 in. Divide both these circles into sixty equal sections. Make 14-in, long marks for the seconds on the 10-in, circle, and for ease in reading, double the thickness of every fifth mark. On the 3-m, circle make the minute marks 1/4 m, long, and every fifth mark 1/2 in, long, as shown. To paint them, use a draftsman's roling pen filled with luminous point between the nibs instead of .nk.

Cut figures about 1 in, high from a calendar to read from 5 to 60. Also prepare another set of figures about 54 in, high to read from 1 to 12. Glue them in position on the dial and give them one beavy coat of luminous paint. This will make the figures stand out slightly in an embossed effect, and they will be much easier to read.

Remove the case from the clock and pull off the hands with a pair of pairs. Remove the face from the motor by filing off the rivet heads



plywood which has an opening to fucally the clock motor

Make the extension for the second-hanc out of the sheet aluminum. Roll one end to form a round tube, fill it with ceiling wax, and insert the second hand that came with the clock. Allow the wax to harden then balance the second hand by adding sorder on the short end till it will balance on a small pail. Give all three hands a coat of luminous paint

Drill a hole in the center of the new face and three or four holes for botting the motor to the face. Bult it on with No. 6-32 machine screws. Construct a wooden frame 12 ill. square stuitack onto it a piece of ply wood with an opening in the center for the clock motor. Give the face to this piece of plywood, and put on the hands by press-

se them care at s and accu- y in piace wi li the pliers. I at four pieces of wood 3/2 iy on ay 12 in long, with the ends on a 45-deg angle, On he Jasin, face of each strip cut a saw a it 1 a6 in. from ge and wide enough to w single strength glass to r. Nail three strips on the around the edge, cut p section of single strength glass 114 in. square, and alide it down the saw stots in the proper position. Then half on the remaining strip. The frame and cover may be stained or

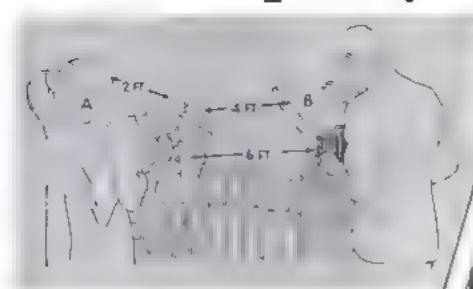
painted in any way desired. Hang the clock in some convenient place in the darkroom and plug it into an outlet

If you extered our November, 1934, photo centest, turn to page 110 for a list of the prize winners.



The second hand is extended by a tube of sheet a um num filled with colling was. It is then balanced with solder

Here's a snapshot you can make Tonight



#### HERE'S ALL YOU HAVE TO DO

Use Kodak "SS" Film. Set your camera for 1/25 accord. Open the lens to f.6.3. Put 1 Maxda Photoflood bulb in lamp A-2 in lamp B. Distances as indicated. Sight the subject, click the shutter—and you've made the picture.

# ALL YOU NEED FOR SNAPSHOTS AT NIGHT

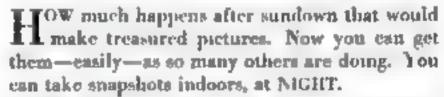
HODAK "M"—the lightningfact film, with the green lightating fluction on the familiar yellow bes—the film that todown or out, to any light, buproves picture quality.



MAZDA PHOTOFLOOD BULDSgive brilliant hight last for about two losses, exceeds for rangy pictures. Cost but 734.



KODAFLECTOR — Inequences, efficient — makes I Therefound bulks do the mosk of 9. 4.0m—plets with stand, reflectors and surd, \$5.



Just use any camera with an f.6.3 (or faster) lens, loaded with Kodak Super Sensitive Panchromatic Film. This high-speed "SS" Film is three times as fast as Vericheome, six times as fast as ordinary film, under artificial light. Two or three Mazda Photoflood bulbs give ample light.

Hold the camera in your hands as you would outdoors, set it for 1/25 second, open the lens to f.6.3. Sight the subject, click the shutter. You've made a snapshot. Indoors . . . at NIGHT.



#### KODAK VOLLENDA (f.3.5)

— a fine substance names. Takensisteen 1.2 16s 1.9 16 tuch pictures on genfluf "rest packet." Sim. Eachtopeed Compur abutter. f 1.2 lens. a synthesis finder. Ideal for an apakets at might. Price—833-39.

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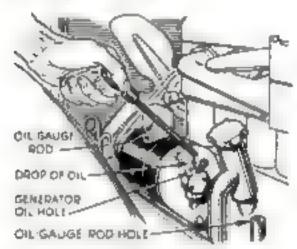
State

# Helpful Hints for Your Car

Motor-Wise Readers Pass Along Some Handy Kinks They Have Worked Out

#### Handy Emergency Otler

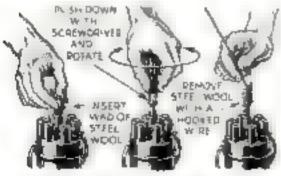
LTHOUGH not recommended for regular use, a bandy emergency offer in present in every car fitted with an oil-level indicator rod. If you find that your generator, starter, or door hinges are in need of lubrication and you are minus an oil can, pull the oil rod from its bose in the crankcase wall. The drop that forms at its end can be applied in many places put readily accessable even with an oil can.—P. M.



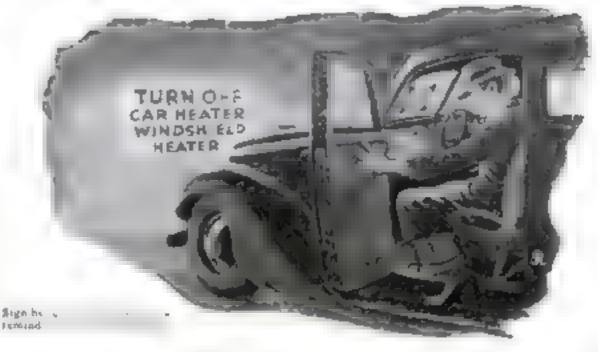
How oil gauge roll to anod for emergency when so you as gave our starter and other patterns.

# Cleaning Distributor Cap Terminals

BECAUSE it is bard to see and even harder to get at, the corresion that forms inside the terminal caps at the topof the distributor can cause many ignot on troubles. To remove this dirt and clean the metal surfaces, stuff a wad of steel wool into the hole and, pushing it thown with a screw driver as fac as it will go, turn it back and forth with a grinding mution. After several minutes, a hooked were can be used to retrieve the wad. Incidestably steel wool has many n her tises around the garage. It is fine for cleaning valve stems and carburetor parts and can be used in many instances where the abrasive dust from either emery e oth or sandpaper might cause a great deal trouble -W G. L



Drawing shows use at steel weel and nerow driver to clean distributor cap terminals



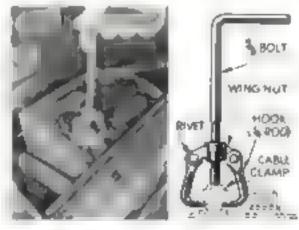
#### Reminder Sign Saves Storage Battery

As A check against forgetfulness, a large sign now bangs on the rear wall of my garage. Printed in bold black letters on a white background, it reads, "Turn

Off Car Heater and Windshield Heater's 1 can't help sering it when 1 drive in and heeding the warning has made forgotten switches a thing of the past—P. A. E.

#### Cleaning Garage Floors

KEROSENE and ashes form an effective mature for cleaning grease spotted tement garage floors. When the surface dirt has been loosened with a shovel or hoe, sprinkle a cupful of kerosene on the floor, rubbing it into the spots with an old broom. Then work several shovelfuls of fine furnace ash into the kerosene and grease. After a good scrubbing, sweeping up the mess will leave the floors clean and white. Although with stabborn spots, a small amount of gasoline an ic used, it must be applied sparingly and only when the garage is well sentiated—to H. M.



#### Cable Clamp Puller

C IRRODED table clamps that stack fast to the battery terminals always are a source of trouble to both the garage man and the amateur mechanic. A convenient puller for these clamps can be made from a few scrap parts as shown in the illustration. All that is required to a length of threaded rod a wing mit to fit two short lengths of small-diameter rod and a few rivets. Turning the center rod pulls the clamp loose, applying the pressure without marring either the clamp or the terminal.—E. I'

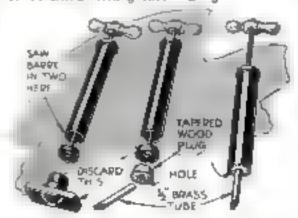


#### Gure for Hard Starting

HARD starting on small cars often can be traced to loosening of the rivets that hold the breaker arm fast to the fiber block to the distributor head. Thus allows the block to shift when hit by the cam and slows up the break, at cranking speed it is bound to cause trouble. I sund y, the only lasting remedy is an enurence only breaker assembly—E. T. G., Jr.

#### Homemade Grease Gun

IN AN old tire pump, you have the makings of a grease gun for your transmission or differential. Cut the barrel down to the desired length. Then, whichle a wooden page to fit the pump barrel, drill it, insert a short length of orasi tubing, and force it into place. The internassiction of the pump planger will a low it to be filled with grease.—D. I



POPULAR SCIENCE MONTHLY

# Ford Materials and Methods

Mr. Henry Ford inspects a part of the history-making Ford V-\$ engine. He insists on the finest motorials and workmanship.

HE most important material used in automobiles is steel; more steel is used than anything else. Ford uses thirty-six different kinds. Most people haven't any idea that there are so many steels, each with a different analysis. Some are low in carbon content, others high. Many contain elements—nickel, tungsten. chromium, molybdenum, vanadium-used to secure high physical properties,

The quality of much of the steel used in Ford cars and trucks is controlled at its source-in the Ford steel mills, Grades of steel are selected to provide high physical properties in all Ford parts. That's why they have high quality.

Skill in monutacture is important not only in development and selection of material but in the production of parts. Ford uses many new and unusual methods

of casting, machining and inspecting. Some were thought to be too scientific, too expensive

to be used for producing automobile parts—until they were put into

use in the Ford factory.

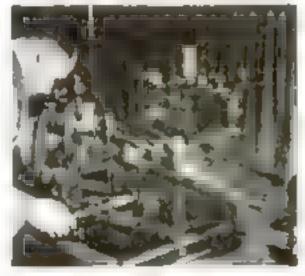
Precision has much to do with the quality of parts. The precision limits set for Ford parts established new high standards. Modern science is used in the manufacture and impection of Ford parts. Inspection machines that have photoelectric cells, or electric eyes, and audio amplifiers like those for radio, are used to check precision. Automatic machines, for example,

can inspect 1500 piston pins on hour. And if they vary in dimensions more than one ten-thousandth The quality of much of the steel used in Ford care and tracks is controlled at its source - in the Ford steel mills.

of an inch they are automatically rejected. The high capaca ity of these machines makes it possible to inspect every single piston pin, rather than a percentage of the production. Such methods further insure the high quality of Ford parts.

Experience and equipment in manufacturing is vitally important. Without it there would be no certainty of high quality. That is another reason why Genuine Ford Parts are so dependable in quality—the best parts you can buy for Ford ems and trucks. Make sure that you get Genuine Ford

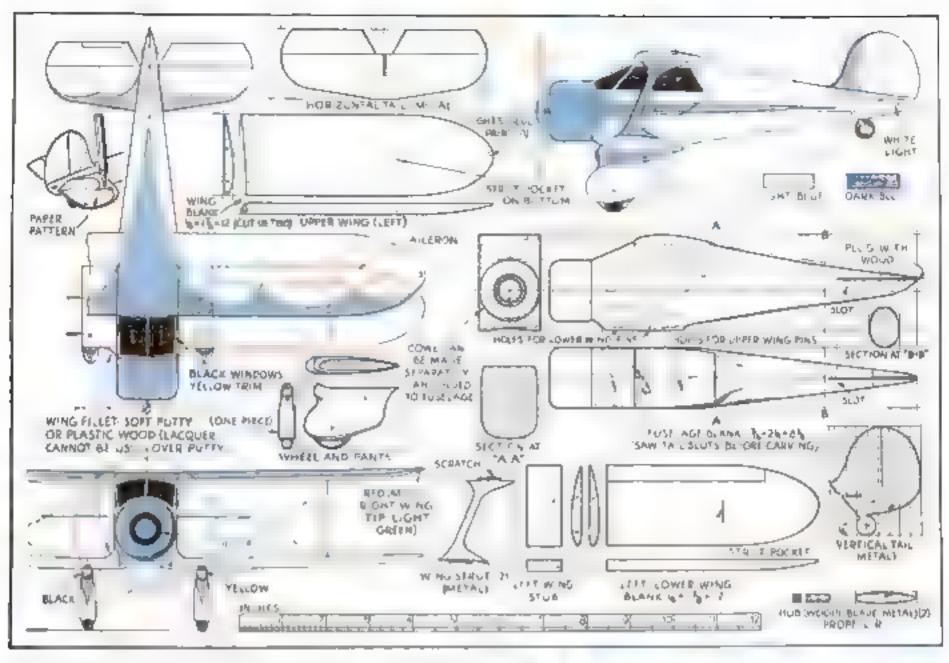
Parts. Buy them from a Ford dealer or from garages that display the Genuine Ford Parts Sign.



Checking the angle, pitch, diameter and lead of thread gage by an improved optical method.

MOTOR COMPANY FORD

DEARBORN, MICHIGAN



PLANS FOR A SOLID MODEL OF A

# Beautiful New Cabin Plane

NE of the most attractive cabin biplanes with radial engines in the Beechcraft. The negative staggered wings, the landing lights built into the wheel "pants," and the graceful curves give the ship is character all its own.

Fourteen units are required for this model, or fifteen if the cowl is made separately as shown in the photographs. Besure to have the fuselage blank absolutely square all ways before you mark the pro-

files and do any carving

You will notice that the wing-tips are tapered on the bottom instead of the top. as is usually done. Shape the wings in one piece, cut it in two, and cut one stub off each half of lower wing. Small nails with their heads cut off, or short pieces of wire hold the wings in place. Long lips at each end of the wing struts, which fit into slots in the wings, keep them in position. Scratch the lips with a sharp point and set in casein glue or cement.

The "pants" are shaped by marinog the profiles on the blanks and cutting them out with a fine-toothed coping saw. Cut away the square edges and round up smoothly

with sandpaper. Nail or give them to the wing stubs.

The propeller is made of three pieces. Scratch the ends of the

blades and glue them in slots in the wooden bub.

Coat the model with clear nitrate dope, then paint the complete plane with light blue enamel Trim it as shown with a rich dack blue. To mark the dark blue areas accurately, cut out paper patterms representing the parts to be left a light blue. Then lay the pattern on the model and

trace around them, using a band pencil on the wooden parts and a scriber on the metal. Use black for the windows, cowlrecess, tires, and other details Paint the landing lights yellow, and the wing up lights red and green, as indicated

In constructing highly simplified models of this type, much depends upon neat painting.—Donald W Clark,



# WHY TAKE CHANCES WITH EYES?



## Good light costs so little

Eyesight is priceless... good light is cheap. Why take unnecessary risks? You can buy a genuine 100-watt Edison MAZDA lamp, the size that is so fine for reading, writing or working, for only 25 cents, and the smaller sizes, 75-watts and under, for only 20 cents.

These good lamps not only help guard against eyestrain... they protect your pocketbook by using electricity economically. And they don't burn out too soon. Why take chances? Look for this mark @ on every bulb you buy. General Electric Co., Nela Park, Cleveland, O.

# EDISON MAZDA LAMPS GENERAL BELECTRIC

MARCH 1935



By
Leonard F. Merrill

Y BUILDING a basement rifle range, any sportsman can keep his shooting eye in trim, to say nothing of smelling a lattle burned powder once in a while, Good light on the target, a bulletproof backstop, a rig for carrying the paper targets from the ficing line to the backstop, and the necessary police permission are all one will need.

To be on safe side, as soon as you have finished your range, have the local police look it over and give their permission for you to use it. This is particularly necessory in the larger cities and may save later complications even in the smaller places.

Materials. Sheet steel or boiler plate, 1/2 by 30 by 30 in. Steel were about No. 14, long enough to reach from fising line to target. First iron, 1/16 by 1/2 by 24 in. Spring paper clip or film clip (1 in. is large enough). Lamp shade or reflector, dark green on outside, with socket fixture set in at angle of 45 deg. One double and one single pulsey about 1 in in diameter. An old sewing machine treadle wheel or similar grooved wheel. This strong cord, such as hard-twist cod fishing line, long enough to reach from firing line to target and back. Two paths of sand, nails, screws, etc.

Backstop, Make the box of wood 34 to 1 in, thick. Cut two boards 6 by 30 in and two 6 by 32 m. Nail a strap or cleat about 34 by 34 by 25 in, to each of the 30-in, pieces on the inside as shown. These are to support the steel plate. Assemble box but leave top removable. Fasten it to sides with one screw in each end. Screw a 6- or 8-in, board across the front about in the middle, so that it can be renewed. This is where most of the bullets will cut the box.

Insert the steel plate and fill space behind with sand to deaden the ring of the steel when a bullet strikes it. About 3 in, of sand in bottom of box will catch the lead after it has hit the plate.

Fasten strips of wood or flat iron to sides of backstop to suspend it from the first-

thore joists, or make a stand to hold it upnight from the floor. The hangers are better. Place backstop at end of basement away from stairs to prevent possibility of injury to anyone coming unexpectedly downstairs.

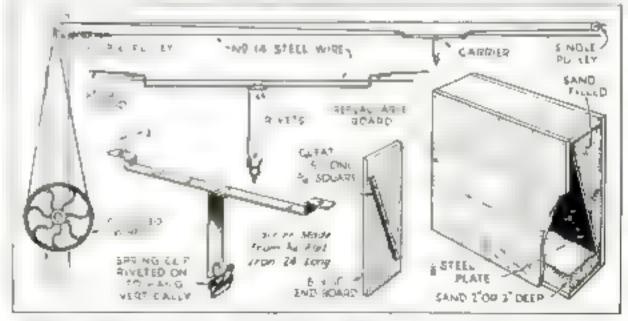
Ture I Carrier, Have firing line 50 ft from the target or as far as the basement will allow. Leave room for proce shooting so do not get the line too near the wal. A post is required at the firing line A "2 by 4" fastened securely at top and bottom will answer the purpose. Fasten one end of steel wire above middle of backstop, and the single pulley about 1 in above wire. The other end of the ware and the double pulley are fastened onto the post. Pull wire as tightly as possible to see that it is all clear, but do not fasten it us is the larget carrier has been made by cutting the 34 in, iron into two pieces and bending them as shown. Rivet the spring clip to the shorter piece. Drill four holes in the longer piece of frontwo for wore and two for cord. Fasten the short from to the long one with two

String carrier on wire, pull were tight and fasten it to the post securely. The one end of cord to target end of carrier; pass other end up through single pulley and down over one side of double one. Fasten wheel to post at convenient height, and pass cord around it. Contange on up with curd, over other side of double pulley, and fasten to end of carrier Operation. Put target in the and turn wheel to carry target down to backstop. Turn wheel in opposite direction to bring target back. A wad of tire tape wound around wire to stop carrier about 2 in, from backstop will prevent jambs and breakage. Place ight as near target as possible either directly above or below the center, with reflector throwing full light onto larget. Be careful the light is out of line of fire. The popular .22 short cartridges are quite satisfactory for this short range.

Are you interested in making sporting equipment? If so, send a past eard to the Home Workshop Department and mention any subjects you would like to see published in Inture issues of this magazine.

#### COLORING LAMP BULBS FOR MODEL RAILWAYS

Colores model-railway train lights often become splotched as the coloring matter wears off. These lights also cost more
than plain lights as a rule. Both red and
green lights, however, can easily be made
at home. For red lights use ordinary finger-nail polish of the dark red shade
known as garnet. For green lights obtain
at the drug store a small quantity of malachite green and dissolve it in clear facquer. When repainting old lights, first remove the old coloring with acctone or facquer thinner.—W V VAN SCOYK



Diagram, greatly shortened, showing arrangement of wire and cords for target carrier, side view and sheech of the carrier itself, cut-away perspective view of the backstop and an end board

# ENJOY THE WORLD'S COOLEST, SHAVE



I SUFFER SUCH



GOSH-SOMETHING SHOULD BE DONE-BUT WHAT ?



TRY INGRAM'S SHAVING CREAM /



ODDLY enough, some men still believe they must pay for a quick, close shave with a burning, stinging face. But - they koven's tried Ingram's!

I is rat in Shaving Cream makes every shave cool and com across. It was whoseers quickly, and at the same he was tres and tones the skin. It speed for a lotton your face feels fine without the

Next time, lather up with lagram's and get a shave you'll actuolly on my '



TRY THE WORLD'S COOLEST

SHAVE

Marker Marker on them 11/2 the name that had I as to got to the a stopped No. 1 a feware to the and a syrete section

Ingram's shaving cream

#### MODEL RAILWAY BUMPER AND LIGHT



The to is pointed light gray or white and. while att. tucky aprophled with beach saud

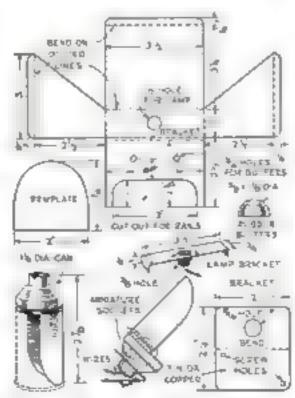
OLD up care supply material for many toteresting and realistic model canway accessories. For example, an instatus obcrete bumper that looks just like the real thing may be made as shown from a sheet of to only by 9 in It is fulded on the dotted times and soutered from the inside

A miniature samp socket is soldered into the la in hole in the bracket which is cut from an other piece of tin. The bracket is then centered under the hole in the top of the bumper, and sowwerd a place

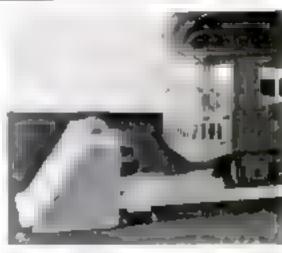
The bumper is painted white or aght gray and when the point has become tacky, white beach sand is sprinkled on. After the point

has thor sughly direct, dust off the excess sand Then attach the two 1 g in diameter rubber butters with No 6. Seems and nuts. The dimensions given are for an O-gauge system. One side of the hum, or is grounded to the tunner, rail and the ware a connected to the

Another tin-can job is the ottle flood light. which was made from a ten cent courb weeder can. The oran ng shows how to make a template of paper that ran be clued to the can-



Row both fittings are made. Hote the tenplate used in cutting the touch-powder can

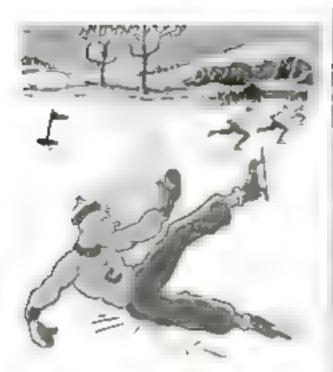


This humper for O-gauga track to made of tin with rubber buffers and a .2-vo't red light

to serve at a guide for the tin theats. The book of the can, after the bottom has been cut away and he body shaped, is soldered at to a hole n be market and a miniature socket is fitted. The light may be used in a variety of ways .- HARDLD W. LONG.



Flood light to be hidden behind a building or tree for illum anting any special feature



# Oilstones win skating races

HOCKEY PLAYERS and champion appeal skaters use India Officeness for taking the burt off newly ground skates. Exhibition tink performers are able to leap, dance and gyrate because they, too, keep their fine steel blades very sharp and true with an arbitrate.

A famous mechanical engineer once said: "Reputations for skill are made only by work-men who know the fine points about sharpening the tools they use." All fine craftsmen take special pride in fast, easy-curring hand tools—kept keen with their bench addresses. Drills, reament and other metal curring tools need less regrinding and last much longer when advisored.

#### A FREE BOOK

"How to Sharpen" is packed with practical facts. It talls why the "India" (esectric furance abrasive), why the rare Arkanass quarried collection are used and how to case for them, too. Thousands of readers of POPULAR SCIENCE sent for this book duting the last few months.



#### Sharpening Specialities

#### RECORDING DRUM FOR INSTRUMENTS

(Continued from page 65)

drill plates, and bolt in place. These brackets can be bolted directly to baseboard, but it is more convenient to mount them on a metal base stop. This makes possible ad-ustment of brackets endwise by sopping paper shows under the stop. End play in dram should be restricted. When dram is mounted, force darring beedle in drive hote up to the eye. Bind with a turn or two of fine wire through eye.

Sorder up a brase standard to hold a wire printer burew it hear end of drum if wire is threaded and a out put each side of stand and close adjustment is possible. This point is set above drum dance opposite end point of needle swing to indicate position of chart end at start of a run.

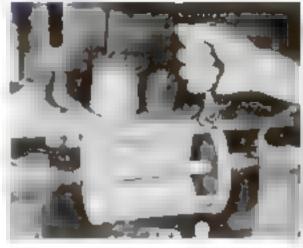
Perce I se cheap alarm or electric clock. Take out glass, sorp off hands, and remove dial. To hour hand stub solder an L-shaped piece of 1 to by 1, in brass, having hose in projecting seg to slip over darning needle. Mount cook on a base to raise its center even with dram center.

Power Cut strap of 1 -1-in aluminum 12 by 12 in., fold lengthwase, harmore bend flat clamp fold between two metal or hardwood strap, and fold wings nutward Hammer them flat uso, remove and trun to width Mount as shown for sidewise payoting and with vertical lunge motion for lifting

pen to remove or replace chart paper liend up sides of cleves have and bolt cleves in at 1 se a handwood dowell over the screw for read clamping Rivet

The dial is sumoved, and a brass oil ceplaces the hour hand for driving the drum





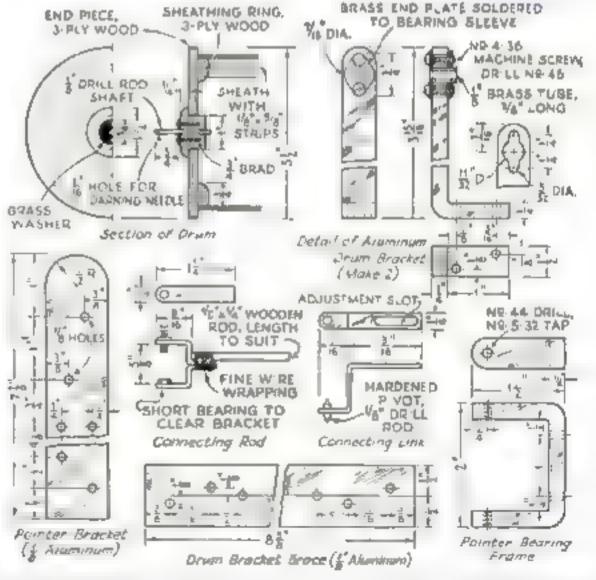
The drum parely shoulded with stripe of place. Each temporary brace is removed when reached

pointer to cleve, stiffening the angle with a bross triangle each side

The pen is a double triangle of bruss, or better tempered sice! File to point and home on odstone. Test writing qualities, If it tatches on paper, "write" on a runnr home to smooth it. Attach to pointer with rivets and a wrapping of fine wire.

First. Cut 14-in. drill rod about 11/2 in long. Grip in drill chuck. While revolving at good speed, file cone on end, finishing it, if possible, with superfine flat needle (jeweker's) the Be sure to get a needle point, then blunt it very slightly by rolling the superfine file over the end as the cod which. File other point in the opposite direction, we nout removing and reversing the tod. As diameter point in the opposite direction, we nout removing and reversing the tod. As diameter point of needle tile. Make pivot glass-hard by heating red-bot and dropping in pan of cold water handpaper scale from center and solder in cleves, use hole

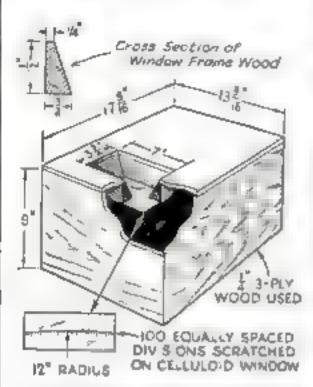
Bearing Frame, Bend, drill hoies, and tap bearing boles, Make (Continued on page \$1)



Detail drawings of drum and bearings, pointer bracket and bearing, and connecting rod and link

#### A RECORDING DRUM

Cantinued from page 80



The cover for the dram has a celluloid window marked with a scale for occurate reading

bearings by gripping drite-rod stock in vise and prick-punching the end. Finish with a punch made like a pivot, but with a leasurate point, so that the pivot makes contoct at the very bottom, reducing the diameter to a mere point. Thread bearings, fire squares on spanks for wrenches, harden, and screw in place with washers added to lock them. Pointer should move with a fraction of it weight, yet with no bearing pay that can be detected. Mount bearing frame on a strip that a horied shitten to a steel bracket for attaching to baseboard. Pivot center should be opposite center of drum length.

For horizontal augment, tighten peedle clevis so that needle presses regainst one end of drum. Swing it to other side and if it does not touch, loosen the drum base-strip screws and shim the strip at that end.

Court Center the window over drum, and glase with sheet retuloid on which 100 equal quisions manching for miles per hour have been seen cited. A cross-arc of 12-th, radius indicates moltop of pen

Anchometer Cam. As described in the January asses the wind gauge was equipped with a dial cambrated for four revolutions, the divisions being proportional to the square of the velocity. While this is so islattery for a direct reading dial it is not suited at all for the limited compass of the 6-in, churt. For instance, the pointer moves was than 1-10 in between zero and 1 is Pit, and between 43 and 40 at 12 it shifts about 42 in. Proportioned thus, a chart reading to 100 M.P.H. would show only 16-in, deflection for 25 miles, and velocities from 75 on would occupy nearly 2.7 v. in.

Conversion of the movement into divisions directly proportional to the velocity is made possible by a cam designed with radii increasing its length as the square of the velocity pushing a following rotter (akate wheel) outward against the tension of a sprint. The drawing, outside, is the exact size, and the accuracy of the recording depends on the care with which the cam is made. It can be roughly cut with a backsaw from 'a in, thick annealed tool steel this fired to shape. The reverse curves at the ends fit the skate wheel and act as stone

Dall shaft hole make chasel mark on underface at start and end of cam curve, and temper cam like a cold chasel

Remove clock spring from anemometer and lengthen shaft with 1/2 in, gas pape. Drill a 1 to-up hole through one end and through the bolt it joins, Continued on page 3.5.

#### PAT O'BRIEN

t morball star Made Hollen and det in 12th, bon tennes d in 16th I line at the fire a literate Bras pure to the fire a literate Bras pure to the fire and the

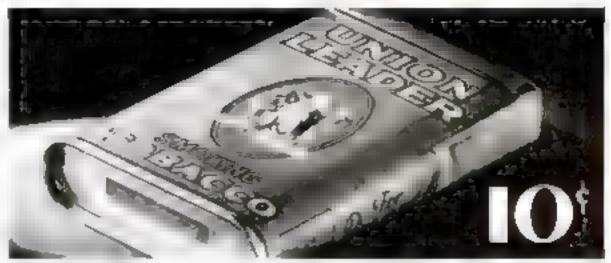


WHO says the best things always cost most? That rule doesn't work when it comesto to-bacco. Because one thin done buys a tin of Union Leader, and if any fancy mixture can top this old, mellow Kentucky Burley for aroma, flavor, and downright pipe-pleasure. I've never found it, and I've smoked some pretty snooty brands! (Greatforeigarettes.too.)

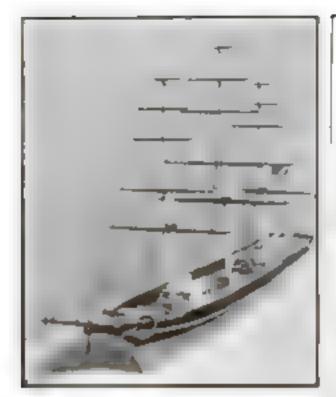
or believe to be



# UNION LEADER



THE GREAT AMERICAN SMOKE



# Complete Construction Kit ClipperShip Model

EVERYTHING you need to make a beautiful little ministure model of the famous American clipper See Witch is contained to a construction kit offered by the Popular Science Homecraft Guild. Unlike all previous chaper ship models, this one has been so greatly simplified that anyone can build it. Indeed, it is what is called a "pocketknife" model because to much of the work can be done with a praknife and a few single-edged razor blades.

The hull of the model in 914 in long, but the over-all length is 13 m., and it stands 8 in. high. The kit contains the huß cazefully mived to shape by hand from accurate master templates, half a dozen pieces of pine cut to approximate sizes for the deck fittings and hoats . hardwood for the keel, stem, sternpost, rudder and other parts; three sizes of round stock for the masts and spars, fiber for cresotrees and capt, thin hand-dyed linen raging cord of the finest quality; thread, small chain, beads, fine wire, casein glue-in fact everything includang paint.

#### Postpaid Complete \$1.50

### Popular Science Homograft Guild, 381 Fourth Ava., New York, N. Y. Please send me a complete construction kit and a binevent for business a summarize model of the chipper ship Sen With A. 1 include \$1.50. Address City (Print very clearly) North This kit is not sent C. O. D.

# What Shall I Make Next?

You can double the pleasure you get out of your home workshop by using great care and discretion in choosing good projects to make. Whenever you are an doubt as to what to build next, consult our blueprint list. The following list gives a wide selection, but if you do not find exactly what you want, send a self addressed stamped envelope for our complete list. Note especially the projects marked with a dagger (†)

Our blueprints are each 15 by 22 in and cost 25 cents a sheet (except in a few special cases). Order by (number. The numbers are given in italic type and follow the Otion. When two of more numbers forcew one tale, it means that there are two or more blueptints in the complete set. If the letter 'R follows a number it indicates that the blueprint or set of bioeprints is accompanied by photographically illustrated instructions which supprement the drawings. If you do not wish this supplement omit the letter "R from your order and deduct 25 cents from the price gaven. Instructions alone are 25 cents each

#### SHIP AND COACH MODELS

Construction kits um available fee? some of their models, See page 105 (

Mitorboat, Working Model (10-in) 294.

Linar-Agu tanta (1 in) 221

11 not: Ca 10 nia (2 in 10ng 200

Linar St Louis (1 in 2) 211

12 Privates of 18 2 Swallow a Balt more ciper (12 in hul 278 227 210 R

Santo Maria (16 in hul 278 227 210 R

Stageroach with horses fee 105 140 R

Trading Schooner (1210 in pull 251 251

Trading Schooner (1210 in hull 251 251

Trading Schooner (1210 in hull 251 251 1 00 .23 Viking Ship 20's in 67.62 R Whole: Wandezer (2836 n.) 231 to 356 Yacht Rainbow (71,52, bull), 233 Yacht See Semat 642-in racing 706-107 R Yacht 20-in, rocing 46 R

#### FURNITURE

Brach, Pireside. Colonial, 187A 188A Chouts, Troubure. 76 Culler Table with Spiras Legs 2054

25

#### RADIO SETS

#### BOATS

\*Canor 16-ic Canvas Covered Kayak, with
as i. etc. 102 191-194 R 108
\*Duck Bost Folding 176 R 25
\*Outhord Recer 105, ft. 114 is 211 211-R 25
\*Sailboat Monatheat Comb nation (12 ft.
cat rig. 111 12 111 R 100
Mercon Rig with Jib for Above, 111A 28
\*13 if Runabout of "Sportheat" on board or infine d motor) 171 177 R 100
\*13-it Ut hey Rowhpat (can be sailed or made with authorid motor), 226 R ... 30

Nove Full-side justierns for any boat marked with an assessed to will be drawn couler for \$1.50 eatra. Since of add this amount to the lot of the bluegers has About one week is required to fill raders for parterns

#### MISCELLANEOUS

Acrobatic Monkeys Toy Oos Legged Table, and Hat and Coat Rack 1884
Bird House, Log Cab a, 2664
Do I's House, Colonia 12
Dolle Rocks Furn ture, 71
Microbeote Ric Portnois 120
†Stin Chart Perpatus, 116
Tis Rack Extension Book Rack, and Torned Hos 1874
Thy Arg and Cockpit with Contrast 114
The Briss and Animals, 1 a Sawed, 56
†Toy D. Il Press, Lathe, Haw etc., 121
Toy Dump Truck Pres Engine, etc., 101 ... 21

#### Popular Science Monthly 381 Fourth Avenue, New York

Send me the theeprint, or houseclats, num-

t am including .... urb a Same 550 5 City and State Uleuse print your name and address clearly



MINIATURE models can be put to many practical uses. For 48 ample, they can be used to ornament the top of small boars for lewelry, to nke top of small boars for lewelry, to nke to or search onery Our Blueprint No. 202 R, price 50 cents, shows how to make a beautifut, sittle Concord coath for this purpose and also how to construct a re nisture. covered wagon for use as a semi-sutomatic c garette container Our smaller ship models may also be erailed down and used to ornament boxes of various alses and types.

#### A RECORDING DRUM

(Continued from page 81)

and put a neil through for a cotter. Also drill cotter holes for test lever and cam. Remount anemometer on roof. (For true measurement of wind velocity, anemometer should be elevated on a must at least 15 ft. above roof. avoiding eddies and air pockets. In this case the connecting shaft should be a built-up hollow wooden one, made as light us consistent with strength and stiffness.)

TURN drive pulsey and fit it with wooden clamp, nailed on. Make simuar clamp to bolt to cam and add these to anemometer shalt F r the ower bearing spindle, which resists adewise mution of cam, insert 1/4-in anll rod in a hardwood play driven into end of pipe keving it with a pin or her er screw on a cap having the spindle soidered in a hole unfled in A rand steel bracket on was or sustable support from roof, having a bearing hose for the spindle, completes this swembly

If skare wheet on funuwer sever jumps off cam, make it trianguar in form, with two well-separated hinges, one above the other, to

Dram Connection. Mount the driven pulley assembly vertically on wall where it can connect with drum mechanism It is equipped with cone bearings, with gears at lower end.

Support the recording base on brackets at proper level with gears. Make an offset connecting link to clamp to its bracket, having radius equal to radius from center of the spur to center of the pivot in its cim. Two cunnecting-rod cievoes fitted with hardened cup bearings and connected with a wooden rod of so to be length transmit motion from gent to pointer Owing to play in gent teeth, some nat motion is inevitable, but can be reduced by pressing gears together to bind a little

One or more springs may be booked to follower arm to get necessary tension and the men which pures around com to ewer can be moved to vary leverage. At 100 m r H., when cum has extended springs to smit, the pull at wheel must be about 4 b. At the start there should be no tension but the connecting wire should begin to strain the spring as soon as motion starts. In the anemometer twist of 400 dex, the pointer pen moves in a chord of o n. if it moves more, lower damp screw that touts connect ng I nk to bracket, and lengthen to lever, if pen moves too the shorten lever To bring pen to zero, pivot the bak slightly to right or self on its clamp screw

Adjust tension of spring so that a lost pull on test sever with a radius equal to that of the anemometer at the vane center causes an angular deflection corresponding to the velocity established for the dial cambration (around

\$2.85 BCP II

Operation Mount chart paper, and ink the pen Regular recording ink is best If this is hard to get, mis a little water color with glycenhe, put a drop between the bibs, and the pen will not dry during a 17 hr run Since chart papers ruled to fit this drum cannot be purchased and hand ruling would be very lanorrous use a place bond paper held on drum. with subber bands at ends, Start the chart at some convenient time, say 7 a.m., and replace IL pt 7 p xx

 $\mathbf{F}_{7\%}^{\mathrm{OR}}$  reading chart, cut plywood rectangle  $\mathbf{F}_{7\%}^{\mathrm{OR}}$  by 18 in., and sail wooden strips along the ends and one edge to enclose a chart sheet Divide the long strip into spaces representing hours, halves, and quarters, and label them to correspond to the chart. Cut a strip of celluloid 4 by 634 in., trimmed along the edges to curves of 12-in, radius, and scratch division marks for the wind velocities. By laying this over chart and against base molding of board. the velocity at any time can be read. If you prefer, lay out a complete blank chart on a sheet of celluloid, with vertical curves at 15minute intervals.



# SOMETIMES IT HURTS TO LEARN...you can't get by without shaving!

HEARTACHE is but one price men pay for failure to keep wellshaven, for stubble is repulsive Women shun it. Lipployers won't tolerate bad-slaved workers. Bristhe can turn friends and associates against you. In view of this how can my man take a chapte by appearing in public without a clean above!

Shaving is not a task with the Gillette "Blue Blade, ' I se this binde and you can shave close and clean every day or twice a day in perfect comfort. There's no pull---poburn, You look and feel well shaved.

The reason for this is simple. The Gillette "Bise B ade ' is minust incredibly keen. It is the product of

manufacturing and appection methods amountely unequalied by other blade makers. Tempered to the exact requires degree of bardness in automatically controlled electric formaces -the blade is then ground, hence and stropped by equipment heat to microscopic limits of accuracy.

Each blade is "anchored" in its envelope to prevent the alightest damage to its perfect edges. It is germ-free, sanitary - your hands are the first to touch it Prove the quality of this clade to your own complete satisfaction. 5l p one in your razor Experience the fluest shave that any instrument possibly can province Ask the dealer nearest you for Gulette "Base Husdes

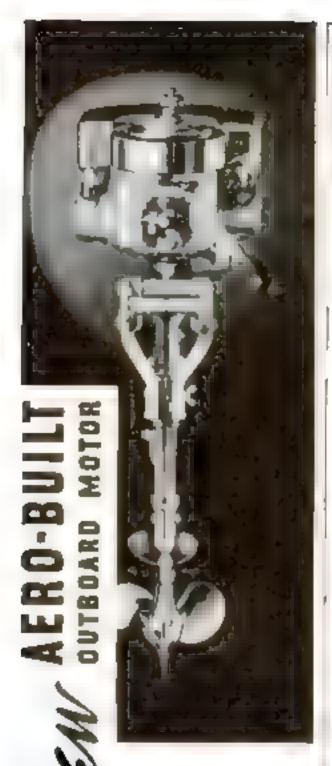




#### The ARISTOCRAT -New Gilletto One Plece Baxor

The Aristocrat is all one piece, no loose parts. Heavily plated with 24 harat gold and guaranteed a lifetime Price \$4 complete with 10 traiette "Biue Blades,"

# GILLETTE BLUE BLADES NOW 5 for 25¢ · 10 for 49¢



The world's emoblest offpurpose, full power twin... two years in the stages of development and festing .. cotsrely different mer-

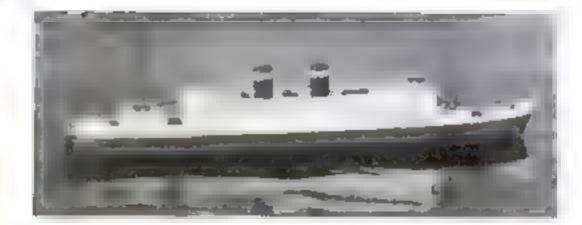
alturgically .. entirely new in design. Its displacement is only 7.6 cubic inchen; it weighs only 37 pounds, and it develops 3.7 N. O. A. Certified Brake H. P. at. 4,000 r. p. m. I A moderate priced outhoard mater, embodying advanced. features of scropputical design.

New Illustrated Blandy Chart. new ready describes this starding new motor in detail and gives com-plete operations on the other 5 great models in the 1935 SFA. FREE!

JOHNSON MOTOR COMPANY 500 Preshing Road, Washington, Ith Connection, Johnson Masor Co., Lab., Preschere, Com.

THAT COUNTS!





Join Our Model-of-the-Month Club and Build the Famous

# S.S. California

FIRST ALL-ELECTRIC OCEAN-GOING MERCHANT VESSEL



No. 1 DESIGNED BY

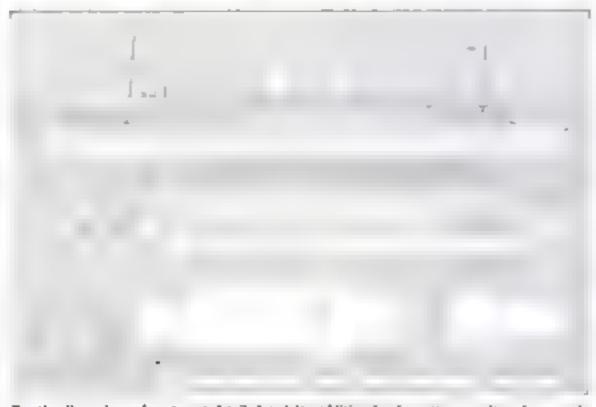
#### Theodore Gommi

ARE you a member of the Popular Science Model of the Month Club? If not, why don't a stepon now? We have an especially interesting model this month—the electrically driven ocean liner Coldonia. To this st o goes the distinction of being the first all-electhe ocean going merchant vesel

For busying this bendtiful it le water I ne model, we have presured a special construction kcontaining all the materals required to make every part. With each at some a furnished blueprint and a long bulletin containing minutely detailed instructions for ausembling the midel The force is only S a print poid anywhere in the United

States A 3 m, need do to ber me el gible for the Model of the Mart. Chil. is 1 - obtain one of these t gottern's acts, see large 10% and cetura to us the application card you will find in it. You will recrive a membership cerufirate and will be entitled thereafter to participute in a activities of the clib

Not only in a series of American ships, but in any last ty of the development of te steamship, the Conformativer sandimioriant place. The electric nerve tead been successfully



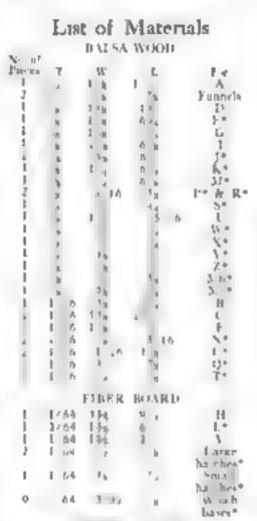
For the directsions of parts not detailed and low additional unformation, see list of materials

employed in United States naval vessels for many years, but it was not until the Panama Pacific Line built the California in 1927 for its intercoastal route that the commercial posabilities were realized

In constructing this model of the California, thin layers of balsa wood are cut out and glaced together by the method described in previous articles (see particularly P 5. M., July '34, p. 78, and Sept. '34, p. 76) The scale of the model is 1 in equals 50 feet, which makes it 12½ in long.

If you have suitable materials at hand for building the model, you can obtain the fullsize blueprints and detailed instructions alone for 25 cents. Please order Blueprint No. 251

Members of the Modet-of-the Month who omed poor to this month are entitled to receive a copy of the instructions free provided they send a self-addressed, scamped envelope-Ask for Model of the Mooth Hulletin No. 5.



MINCELLANEOUS

9 pc, wood 1/10 in. second, 56 long, for Witteber

2 pc. wood 1/16 in, round, 236 long. for master

Plus. 4 with heads removed, 135 in ional for dorrick booms\*, and 32 1 in min for davits" 4 with bears at arhed in force of small centilasses, and o. 176 in some for large ventilators."

I a, shot at if were about I us long for flagtories and become supports

Pain). Black for sale of hall unit fun-nels. 9 winches and bases. 6 large venar its. I small vent layon, and pieces X I' am Z White for superstructure on formas le un foremast base, 4 small yen dators. 2 flagnoles, and arrapes on functions and made and a mifergo top or use a thin white paper strip) Brown for masts A derrick busms, I derrick boost support, and piece I, Bull our brown and white mared) for topsides of D, S, W, Alb and Mr, and for topside of bull unit from \$16 in from bow to 235 fort bew and stom I in some steto to the very stem.

Coment or give and sandpaper (A .6-in. drill and a No. 70 drill will be

found useful If available )

Note: All please marked with acterisk are reads by final assembly when out or he given dimensions. All dispositions are its torbes.



It was then that I learned how easy it was to keep my limited but precious kit of tools in top condition with a Corborandons Stone, in spite of their constant, and at that time, somewhat inexpert use,"

Tools are still framed to me-my favortte means of enjoyment and relaxation—so much so, in fact, that I built my own commer home. Believe me, my Carborundum Stone worked overtime on that job when I

went to work on those tough timbers. But my tools cut as clean as a bound's tooth."

grad protect to only positive of get trade ing. All standard state and gritte

Edged tooks must take severe panishment when hard wood as being worked metal-working tools get even rougher terutment but regular use of a Carborandum Beand Sharpening Stone will keep them sharp and assure maximum efficiency,

#### Send for sample sharpening stone and 48-page booklet

Thin 48-page book by E. Erschnon, well known expert, has 17 large illustrations of the right way to sharpen each adged tool, A little study of this book and every tool you own can always be just right.

It has a "How to Build" section with photographs and diagrams of articles to be made. Instructions are simple and easily understood. The exact amount of

material for each article is listed. It is full of histe that will make working in your shop camer and help you do a more workmanlike job.

With this book you get a handy pocket sharpening stone-ideal for packet knives and small tools. They are both yours for 10 cents in coin or stamps to cover postage.

#### CARBORUNDUM How to teakers WOOD WOLKING 0011 SHARPENING STONES

	4 .		445	ARTHUR AND ADDRESS OF		-
MA				-	TOI	
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The Carbonadon Cosp. Dept. P.J. Nugura Falls, N. T. Enriesed in tera conto (roin or stronge) for your 13-page Hunklet and ample Sharpen-ing State.

Cay

Nation.	-	
Server		
Cary		State

# WOOD IN CANS WILL FIX THESE OLD NAIL AND SCREW HOLES



#### Handles Like Putty Dries to Hard Wood

Plastic Wood becames a permanent part of the object required

Plastic Wood is actual wood that comes in cans and tubes—can be moulded with the hands—when dry it is hard, permanent wood that can be sawed, planed, sanded, drilled, turned on a lathe—will hold nails and can be painted, varnished and lacquered perfectly—it is water-proof and weather-proof.

Plastic Wood will adhere to any clean, dry surface—wood, metal, glass, stone or porcelan.



Here are just a few of the

Repair Damaged Furniture, Loose Drawer Pulls, Loose Casters, Dramboard Cracket Damaged Toilet Seats, Loose Bathroom I stures,

Around Pipe Holes, Cracks in Shewag, Cover Countenant, Screws, Leaky Window Frames, Shingled Roofs, Fill Old Screw Joles, Repairing Lindeans, Filling Floor Cracks, Re daile Worn, Rot Fill oles After Wiring, Patching Astomobile Tops, Stop Windshield Leaks, Boat and Canoe Repairs, Loose Tiles, Baseboard Cracks, Cracks in Stucco, Cement, Cracked Porcelain, Cabinet Making, Pattern Making.



Write The A. S. Boyle Co., Inc., 1934 Dana Ave. Dept. P.S. 3, Concurant. Ohio for inveresting booklet. "200 Things to Do With Plaster Wood."

PLASTIC WOOD



# THROWS PICTURES ON SCREEN

PHOTOGRAPHS and picture post cards can be shown to friends in a more satisfactory and graphic way by throwing them on a screen with a projector like that illustrated

The author med an inespensive eyeglass known to opticians as "diopter 400," which has a focal length of 10 in. Other lenies, such as those used for reading glasses, may also be used. The larger the lens, the clearer the properted picture will be

If a lens other than that specified is obtained, its focal length must be found, because the depth of the projection but must correspond to the focal length of the lens. Go to the darkest corner of the room, point the lens toward the window, and move the lens until a clear trough of the window is thrown on the wall. Then measure the distance

from lens to walt. This is the focal length

The lens is held in a cardboard tube, which tides inside prother cardboard tube Tuen a piece of wood to graft ly the same diameter as the lens. Cut a J-in, wide piece of flexible, smoothsurfaced cardboard, and wrap it tightly ground the wooden cylinder Term it with a knote until the ends just meet, then paste gummed paper strips over the joint. Square the ends of the tube with a skew chisel, and wrap another strip of cardboard around it, joining the ends on the opposite side. Glue the two tubes together and wrap tightby with a piece of 1 and handage. When dry, trum off the ends as he fore but let the second laver project 1 fo-in. over the first at one end to provide a rabbet in which the lens may be gived. A piece of paper

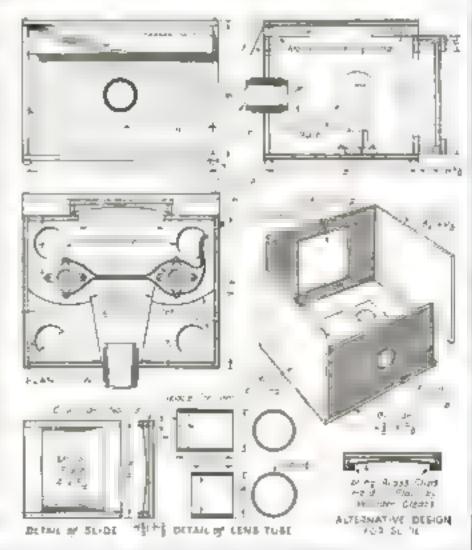
How to make the box, sens holder, and slide

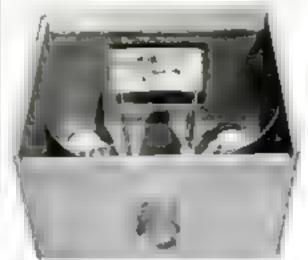
is now wrapped around the first tube, and the second and larger tube is then built up to the same manner on lon of the first

In the same manner on top of the first.

For the box itself, ½i-in, plywood in best bare the hole for the lens holder in the center of the front panel, and the four 2-in holes in the bottoot for ventilation. Also now the opening for the picture in the rear panel, using a coping now. The sides, ends, and bottom may now be glued and nailed leaguher.

The pictures are mounted on a sade, which is shown in detail. A fine sawcut is made at an angle in the two adepters to hold a thin metal plate (tin will do). The metal should be large enough to curve toward the back, in this way all parts of a picture will be in better focus. The simplest way to hold the pictures against the metal plate, no matter





Projector with top comoved. An additional shield or hand in fastened to front of cover

what their size, is with paper clips. A more workmanake method is shown in the alternative detail. Two small cleats are added to the sidepieces of the slide to that two carrow strips of spring brass may be used to clamp the top and bottom of the pictures.

It is well to make two or three shdes to that a helper can mount the pictures, which can then be shown without interruption. The slide is moved across the opening in the back on two runners screwed to the box.

Two porcelain aght sockets are now screwed to the bottom and wired, and four rubberhead nails are driven into the bottom for feet.

The metal plates screening the light, as well as the two reflectors, are made and fastened as shown. These may all be cut from ordinary (in sheets. With the exception of the two reflectors, however, the tin should be painted a flat black, and also the tubes holding the lens. The interior of the box and the slides should be stained black. A black stain may be made from 1/2 oz, powdered niground dissolved in 1/5 pt. denatured al-tohol. The outside may be nowhed as desired.

The painted plates, the reflectors, and the lubes are now remounted in the box. The hest lights to use are 200-watt projection lamps, which take up little room and give a strong light. Photographers' fined lamps give good results, but burn only for about two hours. Ordinary 75- or 100-watt lamps may also be used. Clear plans builts give more aght than frosted ones.

The top is now fastened with screws, the picture mounted upade down, and the box placed about 4 ft. from the screen. A silvercolored screen gives a very clear picture. Move the lens back and forth until the picture is in focus, and proceed with the show. The projected picture of a post tard measures about 12 by 19½ in.

Printed or written words can be read by placing the projection box parallel to the screen and holding a source at an angle of 45 deg. to the box. The resulting picture, however, is not as clear as when projected directly on the screen,--HERMAN Hyperts.

#### List of Materials

$N_{\rm H}$	ed .								
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- 2	Plates (pm)		6	4					
- 2	Places (chr)		3	и		14	7		
L	Plate (tin)		1			- 1	н		
- 1	Place for sible		4			E	1	11.	
- 2	Reflectors		7			7			
	r	-4	1			652	Pa.	2.5	

Two ight sockets and lastge 20 ft. of gamp cord with plug. Iras; 4 rubber-bead

Nove Directions are in in her and fine-bed



OW there's no need to have people calling you "akinny," and losing all your chances of making and keeping friends. Here's a new easy treatment that is giving thousands good solid firsh and husky good looks-in just a few weeks.

As you know, doctors for years have prescribed yeast to build up health. But now with this new discovery you can get far greater tonic results than with ordinary yeast-regain health, and in addition put on pounds of healthy flesh-ond in a far shorter time.

Not only are thousands quickly gaining husky handsome pounds, but also clear, radiantskin, freedom from constipution and indigestion, new pep.

#### Concentrated 7 times

This amazing new product, Ironised Yeast, is made from specially cultured browers' ale yeast imported from Europe-the richest and most potent yeast known-which by a new process is concentrated 7 times made 7 times more powerful.

But that is not all! This super-rich yeast is then scientifically ironized with 3 special kinds of iron which strengthen the blood, add abounding pep.

Day after day, as you take Ironized Yeart, watch flat chest develop, skinny limbs round out attractively. Constipation and indigestion disappear, skin clears—you're a new person.

#### Results guaranteed

No matter how akingy and weak you may be, or how long you have been that. way, this marvelous new frontzed Yeast should build you up in a few short weeks as it has thousands. It is sold under an absolute money-back guarantee. If you are not delighted with the results of the very first package, your money instantly and gladly refunded.

Only be sure you get practice Ironwed Yeast, not some imitation that cannot give the same results. Insist on the genning with "IY" stamped on each tablet.

#### Special FREE offer!

ANKLE

815 IN.

TODAY

HEIGHT, 5 FT. 9 IN. WEIGHT, 165 LBS.

> NECK 151/2 INL

> > THIGH

22 IN.

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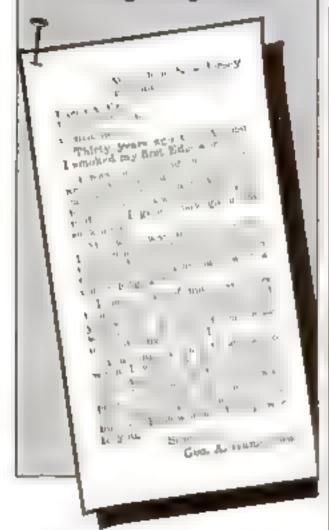
15 IN.

mente en indelg Benefa en indelg Lende yn

To start you building up your health right away, we make this absolutely FREE offer, Purchase a package of Ironized Yeast at once, cut out the sea! on the box and mail it to us with a cl.pping of this paragraph. We will send you free of charge a fascinating new book on health, "New Facts About Your Body," by a well-known authority. Remember, results are guaranteed with the very first package—or your money refunded Sold by all good druggists, Ironized Yeast Co., Inc., Dept. 453, Atlanta, Ga.

# NEW JERSEY PIPE SMOKER USED ONE TOBACCO 30 YEARS

Wife asked storekeeper for "best tobacco in the place" ... and got Edgeworth



#### Mildness and Flavor Win

IT IS the combination of genuine mildness and delicious tobacco flavor that has made Edgeworth famous everywhere. Some tobaccos are mild without much flavor. Others have flavor, but fail in mildness. Edgeworth is the right combination. You can smoke it all day long—and enjoy it all day long.

If you are a stranger to the winning quality of Edgeworth, invest in a 15-cent tin and give it a trial. These pocket tins are sealed in mostureproof Cellophane. Other sizes, up to pounds, are sold in vacuumpacked tins. Ask your dealer. Edgeworth is made and guaranteed by Larus & Bro. Co., Tobacconists since 1877, Richmond, Virginia.

# EDGEWORTH

"More Smoking Hours Per Tin"

#### LAST CALL FOR \$2,000 GUILD CONTEST

(Continued from page 71)

pect to send. This bandful of clubs promises 118 exhibits. These clubs are such a small proportion of the whole, however, that the figures have little significance, but a breakdown of the various reports does reveal one especially interesting point. The largest number of entries is promised for Division 4 of the contest, which is restricted to furniture made with power-driven tools. Only a few years ago, small woodworking machines for amateur use were rare and expensive. Few bome workers had them. Now, however, they are in such wide use that this division promises to be one of the most popular in the entite contest.

The entries of the few clubs that have reported are distributed quite evenly through the various divisions of the contest While Division 4 leads, there is a difference of only four exlubits between it and Division 7, which covers toys and novelties. Only one entry behind that is Division 3, furniture made with hand took.

All exhibits must be shipped in time to reach Chicago not carbier than March 18 or later than March 25. The necessary entry blanks and labels are being sent to all club secretaries.

The Chicago Premer Homeworkshop Club has relied loyally to the assistance of the contest committee and will do everything possible to make visiting club roembers (rel at home

during the establishm week. Earls G. Peek, president of that club, and Alexander Manwell, accretary, have been added to the membership of the national contest committee. Mr Maxwel, has had wide experience in extabilities work, having been connected with the World's Fair almost continuously during the entire period of its construction, operation, and dismanifement. He designed and erected some of the building fronts and also served as maintenance supervisor for the Colonial Vallage.

The following national exhibition delegates have been nominated by their clubs and appointed at members of the contest committee: Dr. C. W. Grauel, Denver (Colo.) Homeworkshop Club; Arnold Schultz, Drion (III.) Homeworkshop Club; Donald Stow, Queen City Homecraft Club; Donald Stow, Queen City Homecraft Club; Blazza, N. Y.; Clyde Newman, Elmhurst (12.) Homeworkshop Club; R. D. Brooks, Topcka (Kam.) Homeworkshop Club, and W. O. Watkins, Tucson (Anz.) Homeworkshop Club

#### CLUB ACTIVITIES

Einhard Homeworkshop Club, Elmhurst, III. Plans are being completed for the club's annual exhibition, which will be held the first week in March. So late a date had to be fixed because the Christmas toy program grew to such magnitude that it absorbed all the energies of the club members and left fittle time for individual projects. To finance the work of repairing and constructing toys, the club can a benefit show in one of the school auditoriums. The performance was advertised and the sale of tickets stimulated by

means of a chad's playhouse, a by 8 ft. and 8 ft. 6 in, high, which was built by one of the members so that the club round offer it as a prize to the holder of the lucky ticket to the show. The house was designed in English cottage style, half timbered, with a fireplace channey, and finished inside complete to electric lights and curtains. If built to order it would have cost \$175. A local merchant gave the club the use of the second floor of a building on the main street for a toy repair shop. Coal was donated, and all the club had to do was to mention what was preded in order to get it. Officials of the Illinois Emer-

gency Renef assisted by furnishing a list of families with children requiring amulance, and the churches did the same. These lists showed the name, age, and sex of each child so that appropriate toys could be given, The club has more than doubled its membership mace it was organized in June, 1934 Among 1/8 members are carpencers, retared business men, salesmen engineers, machinists ar undertaker, a barber, and a grocer

The Poeono I Hometop his hap Club, Stroughlorg Pa The club display won first ribbon at the Munroe County Himby Show which attraced about 5,000 visitors. Three ribbons were won by may idua members. The first ribbon went to J. R. Stanton for an end table and pay-

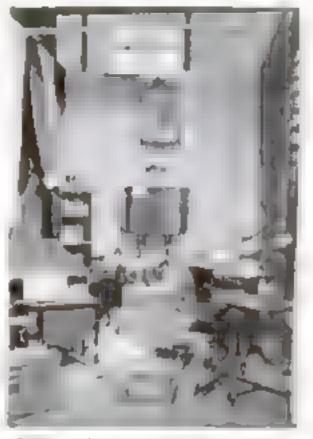
el; second to L. C. Brown for a sculptured head, third to Jumes Moore for wood carving. The club's amortment of Christman toys were turned over to the Edu for distribution. Demonstrations have been given on a namber of subjects, and four were scheduled recently for a single meeting night. A talk on photography was given by Warren Card, the club's photographic expert, and on woods by Oram P. Hoffman. Leo Werson is the club's adviser on leather craft.

Engene Crejtman Club, Engene, Ore. The "Gypsy Carvers", who won first prize for wood carving at the Oregon State Fair and have made large carved decorations for the new library building of the University of Oregon, recently gave a demonstration of their work for the benefit of this club. The meeting was held in the Senior High manual training shop. At another meeting in the machine shop of Ralph Pierce, a demonstration was given on the cold rolling of steel punch-press blanking and forming, electric welding, and metal planing. Some of the machines used had been constructed by Mr Pierce, Methods of spinning different yarm and weaving cloth were explained by A. S Kaulman at a meeting held in his basement workshop. He made the demonstration on a homemade apaning wheel and loom. He is a professional weaver, but also makes a hobby of doing hand weaving at home

of doing hand weaving at home

The Homeworkshop Club of Cleveland.

Through the cooperation of P C. Neals, a member of the club, an entertainment was given for all the members by the Electrical League of Cleve- (Continued on page 89)



Bull bit of Pecena's Homeworkshop Club at Meane County Hobby Show, Stroudshurg, Pa.

#### \$2,000 GUILD CONTEST

(Continued from page 88)

land. The program included a get-together party, a "science of seeing" show, and talks by Mrs. Cella Hadson, director of the Electrical League lecture bureau, and W E. Conney an electrical engineer A number of electrical gifts were given as door prists.

Spokens Homesuffers, Spokene, Wash. The members could hardly believe their eyes at a recent demonstration on the use of a skew chisel in wood torning given by Knute English, president of a sash and door company. He did stants that looked impossible with no other tool but the chisel. His me-

#### ADVISORY COUNCIL

Professor Collins P Bassa

Bean of the College of Engineering,

New York Lauvernity

Professor Clyde A. Bowman Dean of the School of Industrial Education, Stone Institute.

Wennmouse. How.

Harvey Wiley Cornett technical New York Edy

Dr. Hugh S. Cumming Surgeon-General, United States Public Realth Service.

Maj Gen. Benj. D. Foulois Chief of the out Corp. ( 5 dray

Capt. E. Armt age. M. Cann. Founder, Ship Model Meber's Club.

Dr Francis G Pease
Administratory Mr Wares Observatory

Frank A. Vanderlip Banker and Publiciet, New York

gagements do not permit him to attend meetings more often than once a month, but he has been made an honorary member, . Other recent demonstrations included one by Chase Charling on the metal turning lathe, another by J. H. Maxwell, a point company representative, no finish og and a third by Paul Pustey on metal work. Mr. Puspley also displayed a remarkable conection of fine tools. . . . Since this club is limited in membeeship and has no vacanties, W. E. Muchell, the president, and the other officers and members are anxious to see another bome workshop club started in Spokane with unlimited membership. They will give may desired assistance to that end.

Topeko Homeworkskop Club, Topeka, Kans. Thirty boys are now regularly attending the meetings of the junior auxiliary conducted by this club in cooperation with the Y M C A. Among the hobbies followed are woodworking, archery, model sirplanes, leather work, photography, microscopy, and rement modeling. Because of the growth of the boys' division, Clyde F. Cook, president of the club, in an address before the Optimist Club, suggested that woodworking and metalworking tools be provided by any of his linteners who had some to spare. The Optimist Club took up this siles and broadcast an appeal to the entire city. The boys maribary the first one started by any club affinated with the National Homeworkshop Guad and has been successful from the start. .

page of workshop bints.

Jackrowelle Homeworkshop Club, Jackson-ville, Fla. To en- (Continued on page 92).

Topeka Homeworkshop Club News Bulletin' is now being issued in greatly improved typographical style. Besides club news, there is a



#### Jack did, and now he is invited to all the parties. . . . .

IT'S race to be popular with your friends to be invited to all the parises—in on all the good times. Well, that is what happens if you are a good harmonica player.

Thousands of boys and girls all over the country have found the Harmonica a short cut to popularity. At school or at play at parties or meetings, the harmonica player is the center of a group of swaying, sugging boys and girls. Thousands of schools have harmonica bands. If you haven't out in your school, why don't you suggest it to your teacher.

#### EASY TO LEARN

We hout costing you a cent you can learn to play the Harmonica ake a professional in a short time. Mad the coupon below for free Illustrated Instruction Book. The Art of Playing the Harmonica.

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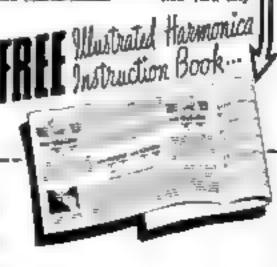
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# UNIRULY

## Stays Neatly Combed

Costs but a few cents to use —a bottle lasts for months

IS YOUR HAIR difficult to keep in place? Does it lack natural gloss and lustre?

It is very easy to give your hair that rich, glossy and orderly appearance so essential to well-groomed boys,

Just rub a little Geostora through your hair once or twice a week — or after shampooing, and your hair will then stay, each day, just as you comb it

Clostora softens the hair and makes it pliable. Then, even stubborn hair will stay in place of its own accord.

It gives your hair that natural, rich, well-groomed effect, instead of leaving it stiff and artificial looking as waxy pastes and creams do.

Glostora also keeps the scalp soft, and the hair healthy by restoring the natural oils from which the hair derives its health, life, gloss and lustre.

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Try it! See how easy it is to keep your hair combed any style you like, whether parted on the inde, in the center, or brushed straight back.

A large bottle of

A large bottle of Glostora costs but a trifle at any drug store and will last for months.

Glostora

Sportsman's Cabinet

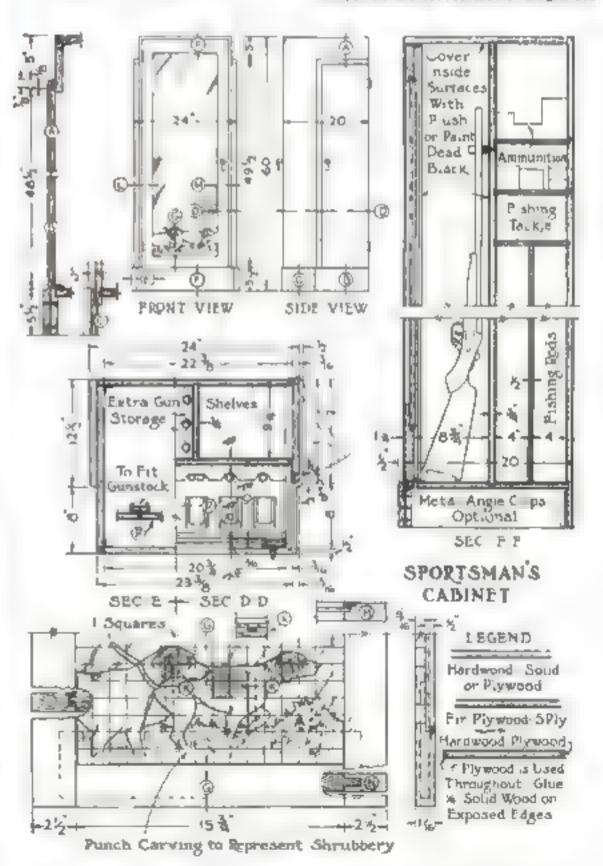
HOLDS GUNS AND FISHING TACKLE

OODWORKERS who also take to bunt and fish will get double enjoyment in constructing this musually attractive and practical cabinet. There is ample room in front, behind the glass door, for the display of five guns, and additional room is provided in the back for the storage of other firearms, as well as compartments for fishing rods and tackle, ammunition, and other accessories.

The extensive use of plywood in this design allows the construction to be kept relatively simple. The dog allowettes, which are lightly carried, provide a touch of decoration that relieves the otherwise severely plain case. Detail K shows how wood inserts are made to strengthen the silhouettes. Choose the plywood with an eye to a distinctive grain pattern, and apply a good finish. Hardware of the ensement window type and hanges of the so-called "invisible" type are the most appropriate, if readily obtainable.—Donato A. Parcs.



Doors at such a de give access to atorage compartments hidden behind the main gun rack



# World's Most Amazing Book of Rare and Secret Information! The Book of Formulas

The hasis of many fortunes! Formulas, Recipes, Methods and Secret processes for making and improving upon beverages, glues, coments, example, paints, counciles, dyes, inka, tooth pastes, soaps, silver and nickel-plating, oils, substeasies, and a thousand and one things for commercial and household and Your fortune may being upon one little hint from this most amazing of books! Information from a thousand sources not normally available to the general publication profit of Popular Science readers.

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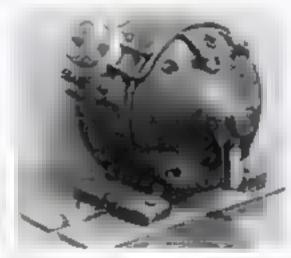
STATE

All L. 4th Ave., New York

#### SWITCH AND BED PLATE IMPROVE SHOP MOTOR

WITH the advent of the modern homeworkshop machine units, a switch altached directly to the motor became so essential that most manufacturers now build one into the frame of their framional horsepower motors. An old-style motor can be modernized in the same way by the sample method aliastrated at a cost of about 5 cents.

The switch base is a block of hard tunber or fiber 4; by 3 by 3 m., suitably divited Grooves and counterbores in the anderside provide space for the wires, the heads of the banding-post screws, and the nuts for attach-



Old home-workshop motor improved with a renvenient switch and easily adjusted bed place

ing the switch. The block is sented to the curve of the motor and ground to shape on a fairly counce wheel. Shallow holes are distled into the motor frame and sapped out with a bottoming tap to receive the screws.

Another device shown to the photograph is a 5/10-in, slotted steel plate to which the motor is permanently bolted with machine bolts, countersunk into the back of the plate. The slott in the ends of the plate should be at least 3 in, long and wide enough to slide smoothly along a 36-in, bolt

Such a plate enables the operator to move the motor from one machine to another with minimum effort, and requires only two \$5 in builts with wing nuls for soturing it. Furthermore, the belt tension may be regulated eas-

Two pieces of leather (an old fan belt or strap will serve) clamped between the base of the motor and the plate will materially deaden the sound of the motor and leasen vibration.—R G. Billians

#### RIBS FOR MODELS BENT OVER HEATED PIPE



RIBS of thin wood or hambon for a model boot or surplane may be bent more conveniently if a variable temperature bending from is rigged up as illustrated. A Z-ft. length of 1-in. pipe is set up in a vise and an electric soldering iron is inserted in one end. The ribs, if of wood, are dipped in water for a few minutes, then bent to shape on the hot pipe Bamboo ribs do not require to be welled. The proper temperature for the bending can be found by sliding the piece to be bent along the pipe.—Stephen A. Fassen

# WHY DO NEW CARS NEED "LIGHT" OIL ?

You've heard friends talking about the new tars of this year needing "ght" on. Or your dealer has advised it, if you have one of the new motors. What a the reason for that ansatence on "lightnem"?

Just this, the car makers, in their constant efforts to step up the effermery of your motor, have been firing the wearing unfaces clours and clour togather.

This heapt to sell the motor against power loss. But it presents a rerious problem in lubrication. Your or not what only a fraction as much space in which to flow between the wearing surfaces, a space too narrow for any but a "aight" oil.

Obviously, the "I ghter the oil, the better it but to be. Not only because there is a thinner film of it no the working parts (though that is reason enough) but because with the new high-speed motors, your oil is subjected to greater beat and treaten than ever before. Therefore, I you would avoid motors damage, buyonly the best.

You will probably find that your more consumes a aide more on with the "Light grades. But the aight extra cost here in early offset by the extra mi cage from your gast line—an economy made possible by the new claser-bired motors.

There is no teason to worry about whether your motor with be "broken in safety with" light" oils of you buy the but. That's why you'll find motor new car owners using Quaker State that year than ever before, Quaker State Oil Refining Co., Oil City, Pa.

"First cloics of Experience"
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#### The Home Craftsman's MOST USEFUL TOOL

One home expert sayer "I can do 60% of many Jobs with Nicholson Files." Another anym "Forty", nome go so high at 70%.

There is little doubt that the world's most popular file - Nicholson - in the home craftsman's must useful took

Here are ten of the most popular Nichobon Film selected by a vote of expert home craft-men: Metal working-Round, Flat, Mill, Half Round, Three Square; for Wood Working-Cabinet Rasp, Half Round Wood Rasp, Last Makers Cabinet Rasp, Flat Wood Rasp.

Hardware stores everywhere earry Nicholoua Files — priced to meet popular demand. Nicholson File Company, Providence, Rhode Island, U. S. A.

Genulne

A TILE LOR LAPRY PURPLISH

#### \$2,000 GUILD CONTEST

(Continued from page 49,

tourage an exchange of shop ideas, a few toembers are talled on at each meeting to describe berefly some particular "kink" they have found useful. A talk on the use of point, stain, and variab was given recently by H. C. Conklin, superintendent of a point manufacturing company, . Two hardware companies have assisted the club by providing mathines for demonstration purposes. In incl, such a large variety is always available that members can try out practically any type of machine ordinarily used in the home An auction sale of projects doworkshop nated by members univened the club's successful first annual Christmas party Besides the toembers and their wives, there were many visitors who took advantage of the nuction to pick up novel and attractive articles for Christmas presents. The toys made by the club for distribution to needy ctuidren were on display, in addition to the projects made especially for the auction sale Four prizes were given-an attendance prize for lactics, another for men, a third for chutren, and a fourth for the member who submitted the most unique project. The suction nelled \$79.15, which was spent for clothing for poor children

Monarch Homecraft Club, Moosa Jaw Sask., Canada. This club is a division of the Manarth Club of the St. Andrews Church of M sore Jaw Organized about eight years ago, the parent club had no other activities than a regular Sunday afternoon meeting four or five bunquets and a dance each year, and various amateur theatrical revues, It has now hern spin up into study and hobby groups, of which the Monarch Homecraft Club is one. The members constructed the scenery for the annual revue to their first

ctub project Springheld Homecraft Club, Springheld, Mast. The organization meeting was attended by 125 of whom 45 Joined the club, fotlowed later by 12 more. It is expected that the 100 mark will be reached in the course of a few months An instructor in the Springfield Technical High School gave a wood turning demonstration at one meeting and the program proved so interesting that the rlub did not adjourn until 11.45. There were about "I present. At an earlier meet int Peter M. Marsh, a focal contractor, exabited wood carvings and gave a demonstration on the art of carving Charles C Gay, secretary of the club, attributes its success and the large (Continued on page 93)

#### Newly Chartered Clubs

Tire following new clubs have been organized and counter charters by the Vational Homeworkshop foold since the February of he of Popular Science M x max was published

Ultance Homeworkshop Club, Al-Talks -

Fig. 114 mars le Homeworkshop Clab, Levinstein like

I'm ershaue Homen kabots Club, Michig Stigitt Laws

Kewanee Homeworkshop Club, Keи эпес и

Lincoln Romeworkship Club, Lin-COLD. NIEST

Manusester Homeworkshop Chil-Manchester N H

Newcastle, Homeworkshop Newcastie Calif.

These tabs are in add tion to those ed a feet to a matter the new curbs will be announced in these communicas soon as posmble after being chartered

IF YOU GLUE ANYTHING

CASCO Glue fixes Teakwood Table after everything size fails?

perience of A. M.C. of Tojango, Colifornia, who writers "I have a cuffee table of teak wood and a smad Both of them with six legs and twelve glued joints. I have ried both hot and cold glue and three kinds of marine cements, but an would loosen in from hix to tweeve months. I is about eighteen months since I gave them liberal coung of CASC OW atterproof GLUE. Today they re as good as new in spine of the fact that this climate is the absolute hour for wood shrinkage!"

digent many projects with CASCO and get a note bles of give right Whospip providing plans are married by survived CASCO hardens shantcarpy Statement providing shart resignation and health. REELI GENEROPE TENT BAMPAR

Write year name and address of france Study Dales " Hartest, Paris, Louder Bestern Salt CASCO THE CASSIN MPS, CO. OF ASSESSED, No.



Any Man, or Boy, who has a Fassion for Making Things Needs this Book

#### IT'S ONLY A DIME

This head tells you have to make Plectro Magneta Plec-troplating On for Secret Locks and Monther Her track Despera You'll lead the desertains and diagrates easy to littless best-fortists ton les ause evers (topp two make will work — 100° p. will work



#### To Pugas—chais a Dimo—Don'i go another day without it

You'll never get more coal instruction for any alime positive every openit their tells in introduced between the receipts of this bank. Seen, 10 tells must are strategy to Brown 528, Jept 11 but 1 Nations Carling Company, Inc., 2011 and 42mm St. N. V. C.



LOOK 11 the part of the state o ACE BARON LABORATORIES Over 1-3 1411 Benefit Oliv



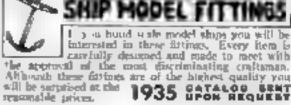
#### KINKADE GARDEN TRACTOR

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BRISTOL, COMMECTICUT

#### \$2,000 GUILD CONTEST

(Continued from page 92)

#### Publicity Will Help Your Club Grow

By keeping your bome work-hop club in the sportische and outsit he he right militie in your care gave new memtion, keep up the interest of the sid ones, and win the support of your community, heretore mpo and o seno reports of all moreones preachtly the isometry and or minally offer the entitors road human in crest photographs are suce also o seen. In more importable being to year ritto god in activation on your deat labor tography to the most hite it you a hit Schwen Mayrour, 381 Fourth Avenue New York, N. Y.

number of visitors who attend the meetings to the enclusiasm of the members and the excellent cooperation that has been given by the tough newspayers

Greater Lowerence Romeworkshop Cinb, Lawrence, Mass. More than eighty members were present at the second meeting of this club. An address was given on the use of power tools, followed by a wood turning demonstration by one of the members.

Midd etown Hameworkshop Club, Middletown, Conn. For severa days before they were distributed, the AQ christmas were made by club members for Maidletawn: poor chadren were estimited in a rocal store window with the gad a charter in the center of he display . . . . Arthur Bronkie a master wood turner, gave a demonstration of a fecent meeting and explained some of the finer points in the operation of a wood-turning lather

he startle Homeworkshop Club, New 20tle, Calif. The monthly business meetings are held in the offices of the Placer ( nust) Hank at Newcastie and he merniculate meetings at the home wuckshops of various members. Among the organizers and tharter members of the club are a lumber company manager, the local telephone company manager a light eastger on assurance agent and an accomment

#### HOW TO START A HOME WORKSHOP CLUB

THE best method of starting a bome workshop club is outlined step by step in a free bulletin you can have by hims out the coupon below. Send for it at once

To amaleur craftsmen the Guild offers the opportunity of enjoying real cooperation and companionship in their hobby. It is the first time this apportunity has existed in the home. workshop field. The purpose of the Guild in solely to promote handicraft of all types. The officers and directors of the Guild are given: their time without pay, and the movement is entirely honcommercial. All the services, resources, and prestogs of the Guid are placed freely at the disposal of the local clubs.

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# **New Scroll Saw**

#### Has Increased Efficiency—New Features



This new Delta" Scroll Saw is another great step forward to scroll saw performance Enables you to use fine blades at Jall woter speed without danger of breakage. Has many other novel and useful improvements. This year the Delta stee of motor-driven

> woodworking tools is more complete. than ever before. Detta standards. of efficiency quality and convenience have been a setly maintained-and Detta prices still kept at their low levels

Good compact motor-driven tools are within the reach of all Every woodworker will find the new 1935 Detur line of unusual

## Send for Catalog of "Delta" Tools



The 1215 catains of Delta quality estates without delay Enchanginly 12 modes driven to be to or off the casts at same time for Book of Practical Delta a mose to the for Book of Practical Delta a mose to the passes of the graphs and for the same time to the passes of the production and not are in low priced as to be within the reach of a bend conjun-ted to come will be placed on the maning list to receive the 1th belts

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 Hard in believe—yet it's true! And here's how we made he ex Anoph such was much half , a drog of LePage a Liquid Clue breaked over the frestly cut ends. Then the two parts fixed together again. When the liquid had dried, one end of the stick was facened to an overhead support and pg the miner end was hang an automobile with two men in it. This was carried in a parade in the run. Was there a crash? No ser' That one drop of LePage a Grap supported he weight of the automobile and the rwo men-Jooo pounda!

Whether you also use pails or screws, always use LePage's Glue-liquid, hard or waterproof-and be asserted of entractour and casting strength. You can get it from your hardware dealer,

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complete without Colold Medium Gloss enamel. Is gives a hand-rubbed effect without the labor of rubbing Its restful, subdued gioss makes it ideal for walls and wood trim.

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# "Keep Out" Says the RCA Noise Reducing

World-Wide Antenna To Man-Made Interference

No more need your short-wave reception be prey to nyery passing supercon- every electrical andgre in your building! The new RLA Dubit-Coubiet anienna sava to men-made poster and br nas in far more foreign state 05. Ask your dearer or service

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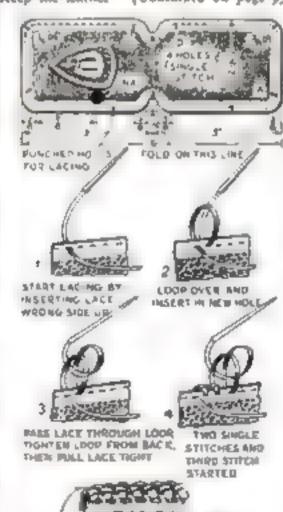
#### NEW KEY CASE DEADENS ALL JANGLING SOUNDS



"HIS attractive key case of new design has several advantages. When carried in a pocket or purse, the keys are inclosed, a snap fastener keeping them firmly in place. When in use, one or two keys run be slid out on the clain, leaving the others inside. This protects the panel of a car in draving and prevents the noise caused by daugling keys.

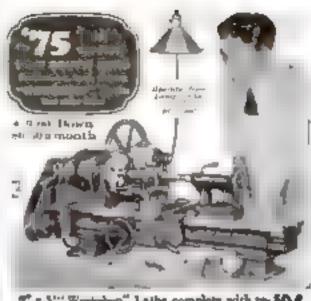
The case can be made from any kind of leather but too og call it necessary if a desain is to be appresed in it. The most popular colors are black brown, tan, and lilue with lace either to mat h or n a darker color for contrast. Materials needed are one secre of leather " a by 0 in., 2 , 3 ds. of 12-in. sace one snay fastroer and one key chain obtainable in five-and ten-cent stores

Lay out the design on paper. Mossten the underside of the leather and faster it to a board with two or three thumb tacks at the edge. Place the design on the leather, fasten with thumb tacks, and trace with a 4H pencil, being careful not to press too hard. Remove the layout and carefully indent the design in the leather with a tracer Lay a dime on each corner and trim off circular as shown at A, rounding the corners 36 in, each way Keep the leather (Continued on page 95)



The key case as it appears when tooled and panched, and the method of acrag the edges

DOUBLE OF OVER EDGE LACING



T' g 5"" Workshop" Lathe complete with re- 594 Versing motor, emitth and drive na shown 634.00 shown payment, \$7.00 per month

PHP 01 " event by 3 bed Westshop Labo is a Sachthe their of wild arrange and machining emigrations. Has not the same indicate power forth carriage gladingled compared services. Cara acrew threads 4 to 40 co took. Write for free Nonge flower and with the production No. 1-W. H interested the larger star within pay for Catalog No. 94,

SOUTH SEND LATHE WORKS 228 E. Madison St. South Bend, Lad.

#### SHIP MODELS

Complete Kits from \$1.00 Up

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TO EAST LEAD SOLDERS, PODANS, THAPPERS, and and Party Astenday 718 Westpholish Tree to fall the second for any state of the second for the se

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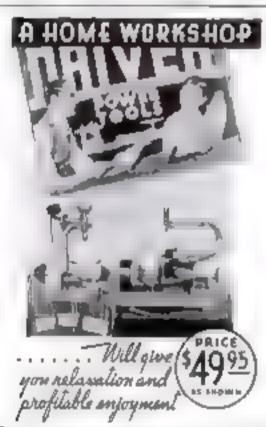




If you were to invite an experienced shop foreman to look over your home workshop. you can bet that one of the first details he'd notice would be the drill chucks.

If they bear the name !ACOBS. he'd nod with approval, because he knows darn well that an accurate chuck is often what marks the dividing line between a workmunlike ob and a mees.

#### THE JACOBS MFG. CO. HARTFORD, CONN.



SCORES of men in every community find relauntion in their home workshops. Washing in wood and metal creating attractive and visital articles of familiary, report-tion and form.

A few years upon a harry workshop was an emporise its which conly prime excited anject indust flower graphes DRIVEN Forest Tools and well within the horse of all DRIVEN FOOLS which preparationed his home workshop FOOLS which prepare read the home workshop provide superior uselity of fewer pussible cast.

If you want to have the most about were power tools send for free fables on new Driver fasterium Books WALKEN/TURNER COMPANY Inc

Plainteld, N. J. 256 Berchman 5t. Pieges sand 40-gags cutaling. Check harp—If you want from Instruction Book felder

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Oh

#### NEW SILENT KEY CASE

Continued from page 431

montened on the underside and work the design with leather modeling tools or sextable substitutes until sufficiently rused. The stipple effect is made by using a rounded tool and tapping the leather until the desired effect is

obtained. Allow to do.
Punch holes for the lacing on a line 1/4 infrom the sides. Touch up all cut edges with waterproof drawing ink or leather dye before lacing. Beginning at A, use a double or overedge style of lacing as shown us the five lacing sketches. At X, lace four boles single stitch to avoid bulkiness when foided. Lace to B, fold over, and face edges together from B to C The end of the lace at A is concealed under stuches at A From C to D, lace as from A to B to leave an opening for the key chain making the single strick again in four boles at X Run the lacing needle under several strickes and rut. This end is now concessed, leaving no evidence of the start or finish of the lacine

Measure for a snap fastener 145 in from the bottom and 16 in. from the side as shown, punch a hole for the top of the fastener and insert it. This will give the position of the bottom part. Punch the hole and insert the bottom part. Insert the key chain and polish the leather

Learning to lace is not difficult if you study the sketches. Start lacing by inserting the lace wrong side up as in the first drawing, Run your fingers the whole length of the lace to pervent two ling, and insert the lace in the next hole, wrong side up as before. This is all there is to single or over-and-over lacing

To face double or over-edge style proceed to in the third sketch, looping the lace through the loop formed in the previous operation Tighten the loop from the back and then pull the bare tight as shown in two stitches of the fourth sketch .- A. W. Montan

#### MIRROR CONCENTRATES LIGHT ON MICROSCOPE



BY THE use of a concave mirror such as is found in an ordinary shaving glass, an amateur microscopist can concentrate the ight from an overhead lamp or from a near by table or floor lamp on the substage murror of his microscope. The mirror should be placed about a foot from the microscope. A lew minutes' experiment will determine the distance and proper angle. - James H. Fay

#### GLASS STAINING DISHES

Geass cup supports for bedposts, obtainable at ten-cept stoom, make excellent stanning dishes for macroscopic work. They resemble the staining dishes used by professionals and can be had in two sizes at the rate of two for five cents.—Envirsy M. Ouson

#### SMOOTHING WOODWORK

Very fine steel wool is invaluable for \$2ishing high-grade woodwork, but not always easy to obtain. A good substitute is the cop-per alloy wool sold in ten-cent alores for deaning kitchen utensils.—R. Y. A.



"HE bound's nose was keen and alert. . The hunter's pipe was strong and neglected. So the rabbet trutted safely back to his home and missus.

A few pipe cleaners and a tin of mild, fragrant tobacco like Sir Walter Raleigh would have put a happier ending to the hunt. Sir Walter's an entremely gentle tobacco, a blend of Kentucky Burleys fragrant as the woods in spring and mild as a May morning. Well-aged, slowburning, it has become a national favorite in mighty short order. Try a tin. You'll find it kept fresh in heavy gold foil,

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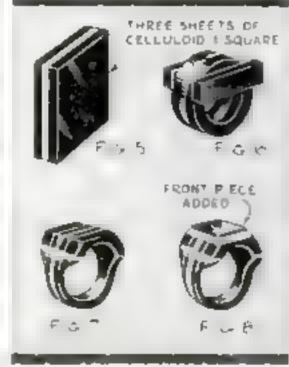
STATE

#### MODERN RINGS FROM OLD TOOTHBRUSH HANDLES

Continued from page 647

has been completed thus far, place it in a vise and ream out the inside with a good rat tail file to the correct finger slar. Next turns the slope between the shank and the built up portion of the ring, many a halfround file. Work down the outside of the shank with a flat file to the desired thickness, then bevel off the top and bottom edges with a rat-lail file to overcome buskiness Study the rings shown in the abotographs. as well as Fres. 3 and 4.

The next step is to sandpaper the entire ring with No. 2 sandpaper, inside and out, Follow this wish No. 2 sandpaper to smooth out any possible scratches. Get a amanamount of purpose stone in powdered form and mit with water to a thick paste, dab this on a cloth lying flat on the table, and



Rings may also be built entirely from sheet cristiand, the finger bein being dyaled out

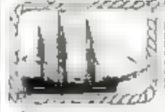
work the ring in a circular motion to remove all roughness and bring to a smooth finish Ruise it with cold water occasionally and wipe with a dry cloth. Continue until all marks of filing are removed. Use the same method to smooth the entire saper and outer surfaces of the ring. The final step is to poosh with a dry flannel cloth until a ligh lungr w obtained. A paste was poush such as its commonly used on automobiles will be found helpful in bringing out an extremely brilliant luster Strangety enough, the nest will acquire a still more beautiful polish after being worn for a week of two, from contact with the warmth and natural ands of the body

Variations of this method are possible For example of you wish a band of contrasting color running through the otherwise pain slank of the rong, the piece shown in Fig. 1 can be split through the center with a very fine saw and the cut edges smoothed to a perfectly flat surface. A thin sheet of telluloid of contrasting color is then cemented between the two rings with acctone. Similarly, two thin sheets may be placed between the shank and the two thicker pieces shown in Fig. 2 The author's first ring was made in this way from a black and a white tomb

The flat front section of a rine can be furher ornamented, if desired, by setting in a stone or by covering it with gold or silver foil, either place or cut to form an initial, monogram, or design. Foll used in this way should, of course, be covered with a thin sheet of transparent celluloid.

If sheet celluloid (Continued on page 97)





#### TOTO STREET

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#### MODERN RINGS FROM OLD TOOTHBRUSH HANDLES

(Continued from page 96)

is available, it is really easier to build a ring up from it than to use the thick material, although a slightly different method must be followed. The sheets range in thickness from 05 to 25 up. Scraps left over in manufacturing operations may be obtained from any number of firms dealing in synthetic plastics at very reasonable prices. These scraps usually range in size from 2 by 3 to 4 by 8 m. They can be obtained in virious thicknesses and in many corors, including beautiful imtations of pearl, mother-of-pearl, veins and motifes, stratifications, roll strations ons, imitation comes and all colors of transhipents, transparents and opaques, grained tvory, shell (plasm and corrugated mottle), on x, wood effects, plaids, checks, stripes, metallic, bronze pearl plain, bronze pearl with fancy blocks, bronze pearl is veins and stripes, and what is called "enence peart

WHEN working with scrap sheet mate-rial—say 36 in in thickness—cut the pieces I in square and lay three sheets on top of one another, welded with acteone between layers. For example, place black on bottom, saturate it with acteone, place a piece of white on the black, and another proce of black on top of the white. Drip acetone around the four edges to reenforce the outside, Let it dry for half an hour. Then you will have a soul piece by in this k and 1 in square (Fig. 5).

Drill out the center to a size a ghilly smaller than mover size, place the blank in a vise, shape off the four corners with a coping saw, and round the edges with a flat fire. If the shank becomes too soft from the friction caused by the fife lay it aside for built in hour antil it regains its natural state of mardness. You will then have a round shank fin-ished nothout any joints.

Cut two thin pieces of white I in, long and 36 in. wide and place one piece on top, across the shank near the edge and one on the bottom then cut a piece of black the same length and width as the white and weld to b acreane on the top and both m of the white pieces, but make the black pieces three times as thick as the white (Fig. 6) Weld all with acctone, When dry, term off both sides and top and hoish as explained in the first part of this article (Figs. 7 and 8)

DON'T file or sandpaper a rung while it is still soft from the effects of the acetone or from the friction of the file, in the early stage, when the liquid is first applied, the celluloid becomes as stocky as tar. It takes from a quarter to half on hour to dry thor-

If you would like to are other articles on celluland craftwork published in future issues of Postular Science Monthly, please send a past card to the Home Workshop Depart-

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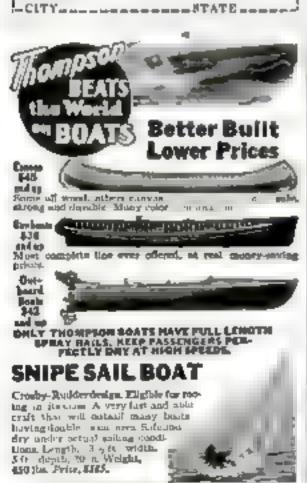
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#### HOW TO CUT A

# New Entrance

In Any Frame House

UTTING an additional entrance a a frame house or even thr ment wall is not an espec-First build the complete frame, consisting

of side and head jambs, outside team, and drip molding at head, as indicated a second Vail securely and brace to the Alexander handled as a unit

Then a rough opening in the way rut in the desired location ab all around than the frame. Add studding should be muced in place - --of this opening, and a header across to .....

If an entrance into the bebunt, it may be necessary to part of the opening through is wall. If a spot can be selected to a ment window already provides this opening in the wall, much labor will be saved

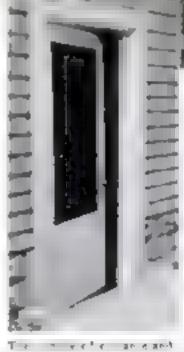
Temporarily wedge the frame ing and scribe a line around strip of wood along the ser of the area guide in sawing through the the sheathing

Paint the surfaces that will afterwards be maccessrole, and slide

the frame book ima the opening till the outside frim rests solidly against the abeathing, to which it should be nailed. The frame should also be nailed to the studding. using blocks between stud and frame pear the nails so that the frame will not be forted out of line

The opening accessor foundation walls and amb should be filled with concrete of a stiff consistency, using temporary forms II necessary, Insert a copper flashing strap at the head of the doorframe. Fit and hang the door and. after putching up the plaster on the inside, hail the inside trim to the jamba.

The entrance illustra-







The frame is held in the rough y cut opening to scribe the obtains

Rough shorouge Over & Door Fren Insude Sidning 500 July 35 ... Quitable Trim INA LAP S OF FAMES Sedamy, West ber Dasp Med of Owhside Trime Section 10g Head name Foundation MALES TO THE EATTERACE VERTIFIED SELECTION THE JUST HEAD

ted is below grade, so the sill was made of rement. The side jambs were allowed to extend about 1 in. below the bottom of the door, and the cement sill was built around them, level with the botloss edge of the door, Bottom clearance was insured by passing the trowel between the bottom edge of the door and the sill before the cement had set. If a wood sill is desired, it may be built into the frame at the start.—Donalo A. Price and Roy Front

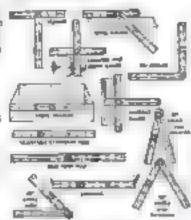


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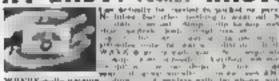
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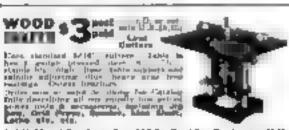
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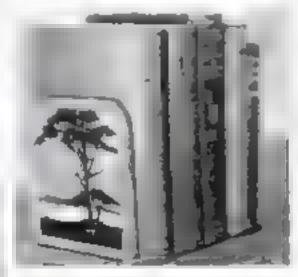
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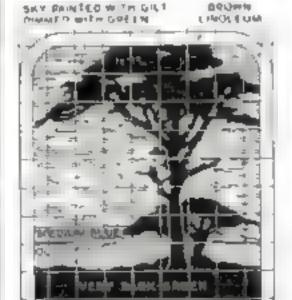
Copy the drawing full size by sketching through a square, and trace the juttern na brown haoleom J. 16 in. thick. Outline

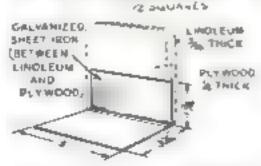


These next, light book ends are faced with ordinary brown Incolumn, carved and painted

with a small enuge or V-tool, and course out the spaces between the sky lines, making no attempt to summit by curs New stup a reccannie of heavy galvaniroù tron and least if at right angles to hold the book end upment Cut out the impleum and a piece of \$4.40 t receptly would the same shape, for burking and glue the two together with linoleum ce ment, placing the upright leg of the icon bedo com

When dry, finish the piece as indicated Pa at the trun brown to match the lindeum. and glue a piece of green felt on the moderside to prevent it from marring variabled surfaces E M L





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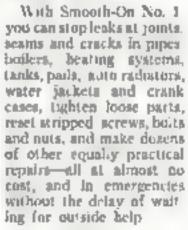


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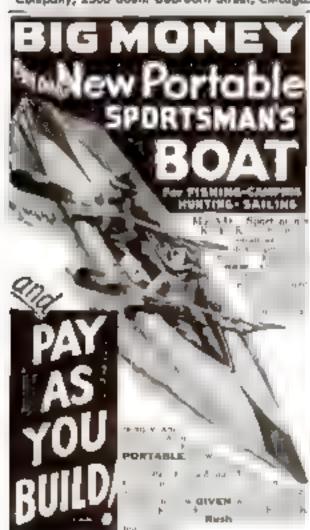
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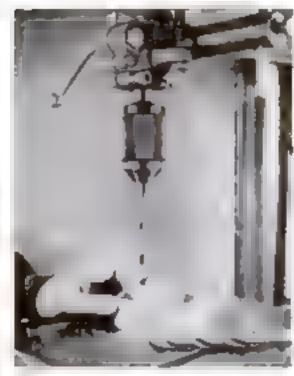
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#### PHOTOS FERROTYPED ON SHEET CELLULOID

If YOU do your own photo finishing and are partial to glossy prints, try using transparent sheet collatoid instead of the conventional ferrotype plates. The latter usually require the application of a waying solution of other preparation to prevent the prints from sticking, but sheet celluloid does not need any preliminary treatment. It may be purchased at any large garage in the form of window material for storm curtains. Before being used, the new sheet or sheets should be washed with soap and warm—not hot—water and well timed. For subsequent use, the sheet is simply sponged with clean water.

Transfer the prints direct from the final wash water onto the theet, lay them face down, place a chamois skin or a clean absorbent cloth on top, and roll them down fairly hard. The chamois will absorb the water which has been squeezed from under the prints, leaving them merely moist instead of dripping wet. Be sure there are no air belts,

Stretch a string or ware in a dry, warm room and use it as you would a clotheshor, by suspending the sheets from their upper edge with spring clothespins or photo clips. The prints will peel off when bone-dry

It must, of course, be temembered that the best squeezerd priors are produced on papers labeled "gloss" or "glossy". Mat, or even semimat paper, will not do.—E. F

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POPULAR SCIENCE MONTHLY

#### YOUR MICROSCOPE FINDS BEAUTY IN SKELETONS

Continued from page 47)

stores, having a fine-tooth, slender blade, is excellent. Make some slices squarely across the bone, others parallel to its longest sides, and still others at angles

With a fine, flat file make one surface of each section as smooth as possible. Then rub it up a piece of very fine emery paper or better still, the surface of an adstone from which all traces of grease have been removed by washing with benzine or dry-cleaning



Cross section of compact bone from the femur of a man. Large spots are Havertian capals

floid. Finally, polish the surface by ruttime the piece on the clean surface of the fine." rasor hone you can obtain. Use water to lubricate the hone and sostone

So far, one surface of the specimen has been ground flat and polished. The next step is to reduce the thickness of the piece until It is as thin as the finest tissue, and at the same time produce a perfectly uniform and amouth surface.

Place a dr o of Canada babam in the cenver of a microscopic stide or a piece of any kind of class. Heat the class gradually over a gas or alcohol flame until most of the soil vent has been driven from the baisam. While the babam is warm but not hot, lay in it the piece of bone, polished side next to the glass, and press firmly against the glass with some instrument until the basson has set This requires only a half minute or se-

Now, with the bit of bone cemented firm ly to the glass, you can file, grind and poledthe upper surface with case. Use water as a lubricant during the grinding and polishing opera one. When the specimen has been made fairly thin, examine it frequently with the microscope so that you will not carry the granding process too far

Remove the piece of booe by adding several drops of xylol to the balsam, and care fully transfer it to another slide on which some fresh balsam has been placed. If necessury, wash the bone in xyloi to remove dirt You will have to handle the piece very carefully, with fine-pointed tweezers, for it is easily broken. Cost one side of a cover glass with a thin layer of balsam, press it over the bone specimen, and set aside to dry. Instead of mounting the specimen in busines, you can mount it dry, or immerse it in some other mounting fluid such as glycerin or liquid petrola, um.

The microscope will reveal many interesting things about the bone. Perhaps the crosssections will prove (Continued on page 103.

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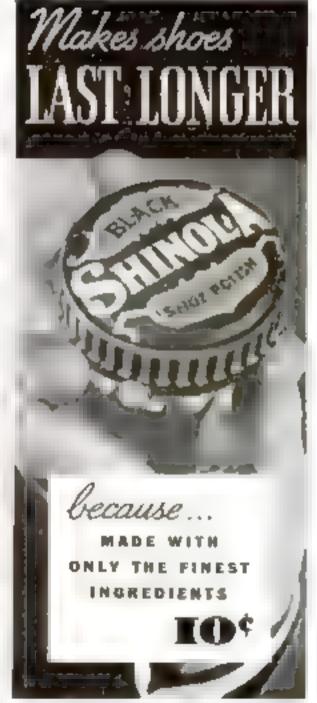
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#### YOUR MICROSCOPE FINDS BEAUTY IN SKELETONS

(Continued from page 201)

most interesting, for they exhibit the details of the structure more prominently

You will see, in the typical bone section, many fairly large openings whose sair and form vary considerably. These are the Haversian canals, through which nerves and blood vessels passed. In circular formation around these canals are the lacunas, minute openings that held the bone corpuscles and tells. These facunas probably will look dark, like solid particles, but that is a trick of the light, for they really are openings, as an inspection by dark-field allomination will reveal,

RADIATING from the lacunas are tlay, threadlike processes, which appear to extend to peighboring lacunus. Each Haverstan canal has several ringlike rows of these lacunat about it, so that the whole bone structure looks as if it were made up of laminated torls, which you see in cross section. The canals and becomes are visible in fountadinal and diagonal sections as well, their forms of course being altered. You can see the tiny connecting threads between lactimus in all sec-BIRD FISH

The autoroscopic examination of bone is more than a mere pastime. Extensive research has shown that ammals and groups of animals all have characteristic bone formations. Very often there are peculiar shapes and arrangements of the lacunas. An expert microscopist familiar with bone formations, can much at a truy fragment and tell with fair certainty from what animal it came This is sometimes of value in crime detection. Physicians can use the microscope to study doesed conditions of bone. Scientists who delve into prehistoric life can employ the microscope to identify with certainty bits of famili bone millions of years old

The method followed in making hone sections, that is, filing, grinding and polishing of thin shees until they are reduced in thickness to the point where they become almost transparent, can be employed for other specimens. The teeth of animals can be prepared in similar manner. However, the hard enamel covering many kinds of teeth presents an additional problem, for it is very hard and brittle, and does not submit easily to the ordinary mw. A back new can be used, but we dull quickly. A wheel charged with dismond dust, such as are used for jewel cutting, is much better. Perhaps a small hand back saw, with the blade reversed so that the touthless edge is presented to the specimen, could be charged with water and powdered emery or carburundum and med for slitting teeth-if you have the time and patience. Once roughly cut, tooth sections are ground and polished in the same manner as

There is no hard-enamel problem connected with the teeth of fishes. These have no heavy coat of enamel, and therefore can be cut easily with a saw,

"F"HE shells of sea animals, being composed I largely of limestone and other hard materials, can be worked into this sections with the same tools as are employed for bone or teeth. Because of their greater brittleness shell sections must be handled with greater care. Sometimes the thin sections must be left on the shde to which it was remented while the second surface was ground and

It is interesting to subject specimens of hone and shell to the action of acids, which remove the deposited mineral matter, leaving only the animal thouse. In fact, a common method of obtaining bone sections is to snak peces of the material for days or weeks in acid until the min- (Continued on page 1 3



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#### YOUR MICROSCOPE FINDS BEAUTY IN SKELETONS

Continued from page 1 2.

eral matter has been removed, and then debyctrate, embed in paratin, and section on a microtome like any other soft tissue. Macroscopic stains can be employed on such specimens.

In a simular way, the animal port of a sea shell can be separated from its calcareous deposit with hydrochieric, nitric, or sulphuric acid, diluted with three or four parts water Removal of the numeral material is accompanied by hubbling as curbon dioxide gas is produced. Use plenty of and solution, so that when the bubbling stops, you will know that only animal tissue remains.

THERE are certain made value bone or mens that can be sectioned like bone or fruits. \*HFRE are certain hard vegetable specishell. The dense stones of various fruits, such as peach, cherry and plum, make excellent mar iscone spectmens when cue total him sections by the same methods as those used for bone.

Microscopists seem to favor balsam as the med am for mounting taken plant phetetons and similar objects when they are to be examined by polarized light. Bone sections also are mounted generally in balsam. Care must be taken to exclude bubbles so is to obtain perfect penetration of the balance, and to prevent it from entering the openings in the bony structure.

The use of balance as a mounting medium makes it unnecessary to enery the final porishing operations to a point where all minute scratches are removed. The balsom fills the smallest marks and renders them anybable or unobjectionable. Some workers claim, however, that baisam goes too far in this direc-Han, in the case of bone, and blots out such detain in the lacunas by filling them up.

When the ground and polished surface is to be rendered as smooth-appearing as posother desired details, the bassam can be leated on the sade until most of the solvent is removed, as was done in grinding the sections. Then it is minwed to cool until the point is trucked where it is tacky yet win not flow into the minute openings of the hone. The specimen is pressed against he balsam him and held until the balsam sets. Then a cover glass is similarly conted and pressed on top of the bone. This process may require a bit of practice before complete success is attained. Edges of the cover glass can be supported by allowing some fluid balsam, but not enough to soften that surrounding the bone, to run beneath Ugem,

After seeing the beauty revealed in bone by your microscope, you will realize that one of he most fascinating things about this bobby is the way it converts ordinary and even republice materials into something full of unsuspected wonders.

From George J Harris, of Lonaconing, Md., comes an insentous suggestion for easily handling live insect specimens while studying Cocir heads.

TO EXAMINE the head of a live fly or other insect," he says, "make a small cone from paper. Gaue the edges, cut a very small tip from the cone-leaving a hole large enough for the head of the insect to pass through-and place the insect in the cone When It sticks its head through the opening. push some cutton into the cone to keep the specimen in place. A specimen held in this way can be placed under the objective, and many an interest og feature, beretofore unnoticed, can be viewed easily."

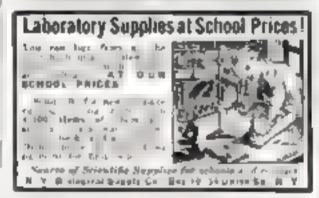
Construction of the cone, as described by Mr Harris, is illustrated in the accompanying photographs.



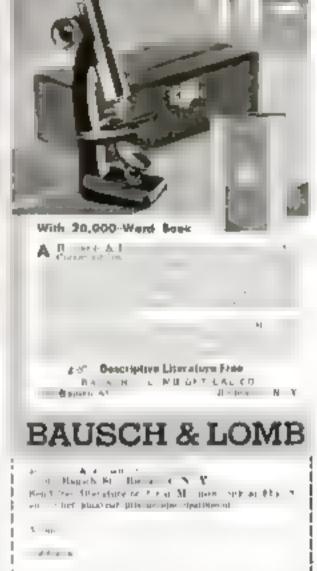
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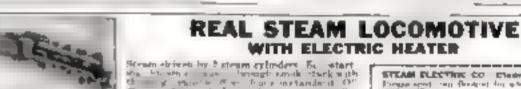


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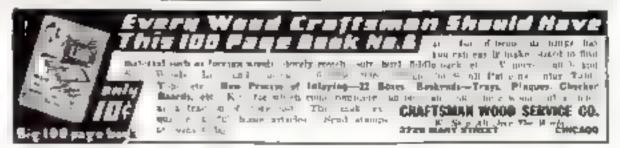
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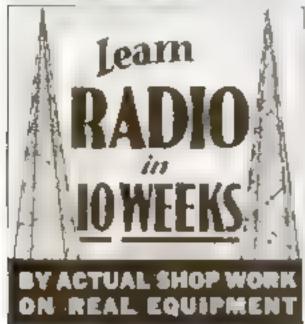


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#### Many Earn While Learning

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#### CAST TOMBSTONES BUILD A NEW BUSINESS

 $\Gamma^{
m HE}$  lot of a skilled artisan is not an easy one when tautding con-Struction to in the doldrams So Henry Belt pige. terer thid some fall thinking You can t sit idic ong when you have a large family to support.



Among his friends was a young Frenchman, who, in more prosperous times, had been sculpturing figures and designs for architects One evening, the idea of making tombstones from artifical stone was broached It had pussed they and both Her, and his semptor friend decided to give the suggost on a rev

The sculptur sketched a simple pattern for a some sewer his model and gave it to seel to east in plaster When the mold had hardened, he I to ed it with a mixture of cement and selected crushed gramte. A few days later the cast was removed from the mold, "touched up" with a chief. By the sequetor and hand por ished by Rell So far so good. The miter a s had cost only a few doilars and for s workshop they used Bell's cellar

Now came the problem of marketing their product. The story, circulated by enthusiastic friends and neighbors, soon got around and within a month the first order had been executed. The low cost of the "stones" had a real price appeal and it was not long before an order was received for a mausoleum.

Today, after a year and a half of consistent hard work by Bell, his partner and two salesmen, the business has outgrown its basement beginning and is now housed in part of a small stone works. Small advertisements are being run in the local newspapers and what eighteen months ago was no more than an idea is now a wellpaying family business that has all the cormarks of being not only permanent but one with a real future

J.C.D.T., Hudson, Ont., Canada.

#### PRINT SHOP ON WHEELS



WANA I par ticular y disappointed to find a pink slip at my pay envelope one Saturday night. During my twelve years experience I had not only learned the printing trade from bottom to top, but bad managed to





Wednered Galanti of Maria arrest Date at 19 Strate St. Brast OCP Printering Bred Bart STUDY AT HOME And hip meet by pro-pose to the pro-legative point of the P large pro- point of the pro-position can be a super or pro-position and be a super or pro-position of the pro-ference of the pro-ton of

\$3,000 to \$10,000 Annually The grants prompting by they the property of from the first property of the first prompting Extension University, Dapl. 202-L. Chicago



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THE TRANSPORT OF LOAD, R-B, Starting, M. Y.

#### PRINT SHOP ON WHEELS

accomulate a savings account that would put me in business for myself.

After sinking my few hundred dollars into a small but modern printing shop, I anticipated big things-but soon I learned that all the pluck, inftistive, ambition and energetic effort we hip my being could not cope with established competition in an over-crowded final

I used every weapon to secure business, except that of unethical price-cutting, yet the rewards scarcely paid the rental on my abop.

Someth ag had to be done. I knew that a forced sale of my equipment would mean a tremendous loss to me, so the nest best thing was to try to trade it for a more promising line. I meeted an adin the "swap" column offering the busi-

ness for what have you. My first-and on v-repov to the adwas from a young man who had had experience in a job printing shop, but had branched off Into the trucking business He owned a good three-ton truck, and sought to trade it for my equipment. He confessed that the truck transportation business had been somewhat uncertain lately, and I, too, with Washingtonian honesty, admitted my disappointments in the independent printing shop game

Real zing that we each apparently possessed "white elephants" as far as income was concerned, we considered means of co-operating and our ultimate decision was to attempt a novel experiment.

That was about a year ago, and now we have what we believe to be the most completely equipped, If not the only trave ing job printing shop in the country Instead of bringing business to the short we take the shop to the business, visiting villages and small towns where no shops are located. We give "while you want service on amor and rush jobs, horsing the bigger orders for future delivery when possible—and, bedeve it or not, a good portion of this work is done while our shop is traveling from place to place. We have one assistant

Our portaine shop is not spacious, and we must resort to a foot propelled press out from the first day on the road we have been busy even to the extent of missing Sunday School'-Z T, Branford

#### STARTS SHOPPING SERVICE

BERT tossed aside his magazine. He wished gramly that he might find a job. There was very lit tle business activ ity in the small New Hampshire town in which he lived, and the future looked black to him - nothing



to do here, and no money to go etsewhere. What chance did a young man have? He rose and stretched—he supposed he might as well do that repair job on his old car

The work had progressed only a little way when Bert found a part which needed



Copy this girl and send us your drawing perhaps YOU'LL WIN & COMPLETE FEDERAL COURSE FREE! This contest is for amateurs, so if you like to draw do not hesitale to enler

#### Prizes for Five Best Drawings-FIVE COM-PLETE ART COURSES FREE, with drawing autitit. (Value of each course, \$190.00.)

FREE! Each contestant whose diawing shows sufficient mer I will receive a grading and advice as to whether he grishe has, in our estimetion, attnuc talent worth developing.

Nowadays design and color play an Important part in the sale of a most everything. Therefore the artist, who designs merchandise or illustrates advertising has become a real factor in modern industry. Mechines can never displace him. Many Federal students, both men and girls who are now commercial designers or illustrators capable of earning from \$1000 to \$5000 yearly have been trained by the Federal Course Here's a splendid opportunity to test your to ent. Read the rules and send your drawing to the address below.

#### RULES

This contest open only in amateurs 16 years old or more Professional commercial artists and Federa students are not a syrble.

- 1 Make diawing of gill 5 laches wide on paper 61 a inches equare Draw only the girl, not the lattering,
- 9. Use only pencil or pen
- 3. No diswings will be rebungd.
- 4. Write your name, address, age and occupation on back of drawing.
- 5. All drawings must be received in Minneapolis by February 25th 1935 Prizes will be awarded for drawings best is proportion and neatness by Federal Schools Faculty.



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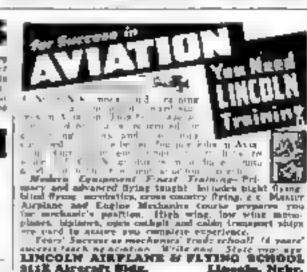
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MARCH 1035

# Success



while you are young enough to enjoy it

"I'M meeting Armstrong this afternoon at Ingleside—last chance for a little golf before we sail for Europe on the fifteenth . .

Pretty soft for Bob Carnagton, you say-a lovely country home, gulf on a week-day when the other has a great as a gar the other a sigweeks' trip to Lurope with the iam y - and all t' aw wer al success while he sate young ence tweet vit

But why not the active upon success to it could be a thirt to a thirt or a third or a thirt or a third or a thirt or a th

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Will you wait till the golden years of your life are
Inst slipping away—or will you get your path toward
success while you are still young enough to enjoy it?

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Property Position

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#### STARTS SHOPPING SERVICE

replacing. He walked over to the town s only garage. "No," they told him, "we don't carry that part in stock. We'll order it from Concord, and it should be here in a day or two."

He turned homeward, grumbling inwardly at the inadequacies of the towns stores and other places of business. "You can't buy anything bere," be muttered under his breath, "except bare necessities."

And he was correct in his complaint Everything else had to be ordered from Concord or Manchester, and the train service made delivery anything but prompt This condition prevailed in practically all small towns. Suddenly he had an idea. There must be a lot of people in towns like this, he thought, who wanted things from the city every day-automotive parts and empreent books and stationery, photographic goods, musical goods Why wouldn't those people jump at the chance to get the things they wanted quickly and safely? There were three other villages between Bert's home town and Concord, and the roads were kept open all winter. He could drive his car to the city each morning, stopping at the gatages and stores in each town to take orders. He could then make the purchases in Concord, and deliver the goods on his way home in the afternoon. It would cut at least twelve hours from the time now required to get anything under present conditions. People should be willing to pay a reasonable charge for such a service, he thought

Bert put his plan into action the following week. At first, of course, business was slow. But news spreads rapidly in small owns and Bert did a little inexpersone americang. Soon business men and townspeople alike came to know of him and to depend upon him. Every stop yielded commissions.

Bert has bought a better car since he began his shopping service. He is steadily and profitably employed now, and his business is increasing all the time.-W. T S., Warner, N H

## Cash Prizes

THIS department will give \$5.00 for every true success story submitted by readers of Popular Science Monthly, and which is accepted for printing in this magazine

Manuscripts will be judged on the individual merits of the case and circumstances involved. Only stories in which the author's success, or that of some one known to the author, has been gamed by some method of educational guidance, fitness for the job, or application to the work will be considered. We are not looking for the "get-rich-quick" type of story

Manuscripts must be confined to 500 words or less. They must be true and, if accepted, authors must be prepared to give us signed statements to the effect that they are true. Manuscripts submitted and printed become the property of this magazine, and we are not responsible for the return of rejected stories unless postage is provided for this purpose. Address contributions to Success Story Department, Popular Science Monthly, 381 4th Avenue, New York City.

## **How To Secure A** Government Position

We present the other tale. The are into Transmission of the Constitution of the control of the c



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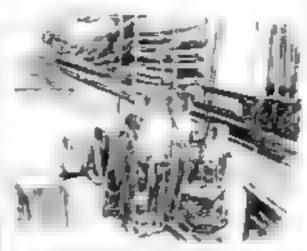
Opportunities in

Page, 1344, Marin Marine on the



#### NEW SCHOONER MODEL

(Continued from page 69)



Most cings and life rate of L. A Sempoon

as shown in the detail drawing just abuilt the natural line of the hawse pipes

If the model is to be of an auxiliary schooner, the stern will be differently built so the lines for this are also been

A schooner of this type would probably have a hand wanch at both hatches, but no provision is made for a donkey engine, at-" many schooners carried one. The steering gear presumably was of the worm

Plans for the forecastie and aftercation are given so that these parts can be bried it deused, with skylights that lift up and texcuithe interior

The spars are some and the rough, were Rica be serous eturnous kies, are to mated in place of deadeyes for tichtening on a new shrouds and backstave, but many masters Still prefer deadeyes, because the lanyard have just a little gave and there is nothing to ecome fusts.

Battens would probably be used in place of rathnes, but not invariably Sometimes they extend to the taps, and occasionally all the way up. It rations are used extend every 61 h.

to the or to be about

I to raise at the mains were usual but this sever does not appear to but that there so I twice men ed pass a water he is to these would be holted to the ambers more diate's utiler the unde tin re. There are no channels, and the chain plates are set in grooves in the la T

Enlarged details of the from work a six are shown. These fittings are president to schools

Quite a few of the more recent schooners have been fitted with a standing bowsprit but the bowsprit and jib boom shows are the to the al. This rig calls for the usual dolpeop street in ringules and backropes, with as a mile a short knee-shaped cathead. The stance boom on an enque office

The name and size of he saw can be taken It im the man, but if you are not familiate with sails it might be well to stad a preson at ticle I wrote on fire and It sails PSM Sept 1 p 64). Before shappen, the mass de not forget to place the house and the hanks (rings) on them, as well as on the lotestays for the his

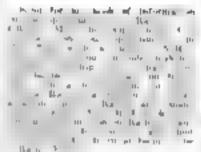
The jib sheets will be double, with long pennants, heavy blocks, and runners, one leading to each side—the weather one being slack. The fore and main boom sheets will be twofold with the lower blocks shackled to large rives which are boiled through the deck to neums.

The tackles shown under the booms are to steady the booms on either side. The sail topsail tacks go on the lee side of the peak halyards and are dipped, if the schooner is to remain on one tack for long.

For a longer vessel with more masts, the added masts would be duplicates of the mainmast shown.



# Will Train You at Home to Fill a *GOOD Job in*





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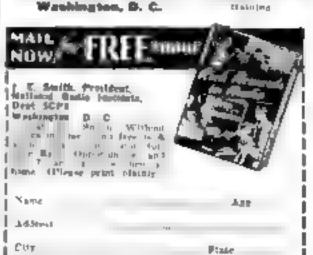
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ANY DURING SCHOOL DAME S-R, Sec. 2204, Ch.

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#### TIME ALWAYS MOVES FORWARD

DO MEN WHO MAKE THE MOST OF IT! THIS COUPOR IS AN INVITATION CHALLENGE TO SATISFIED TO SAME JOES-UNTIL THEY LOSE THEM!

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# NEW Construction Kit



ΟF FAMOUS CLIPPER SHIP

At left is our new kit for making a model of the American chipper thip Sovereign of the Seas, as shown below

ARE offering this month what so many readers have asked fora special new construction kit for a scale model of the famous clapper ship, Sovereign of the Seat. Not only in the model itself of the most popular size and type but the materials also represent the best value ever offered in a clipper ship construction hat of comparably high class. The price is only \$4.95, postpasd anywhere in the United States east of the Musissippi River, and \$5.45 west of the Mussesppe

The model was designed by Capt E. Armitage McCann. It is 1954 in, long on the load water line, 26 in long over all, and 163/2 in. high—an ideal use for the average room. The wale of the model in relation to the original ship is 1/12 in, equals 1 ft. The construction kit, which is illustrated in the photograph above, contains the hull members or "lifts" cut to shape, and all the necessary wood and other materials, including such hard-to-get stems as very fine chain, colored flags made specially for this model, and anchors. Three blueprints and a set of illustrated instructions accompany each lat-

The Sovereign of the Sous is one of our standard thip models and ranks with the rest in accuracy and beauty, but it is easier to construct than most of the others, Hundreds of renders have already built the model with complete saturaction, although they had to work from the blacprints alone without the advantage of a complete construction les

Another new kit this month is for a trading schooner, with lifts cut out, two anchoes, brass ladders, saddleth, three bottles of paint, one bottle of varmsh, and two blueprints See hit V in the list

The following last gives all our construction kits. The Model-of-the-Month kits are the easiest to build, being mainly of soft balsa









KIT O-An Il-ia, model of the \$. \$. 5t. Laurs



S. B. Atlantie













#### Earn Cash at Home!

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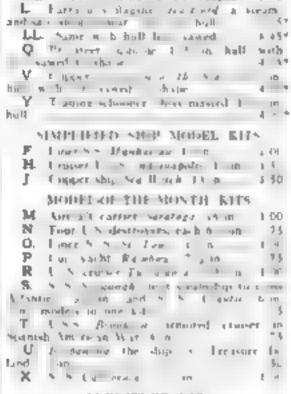
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#### Wonderful New Invention

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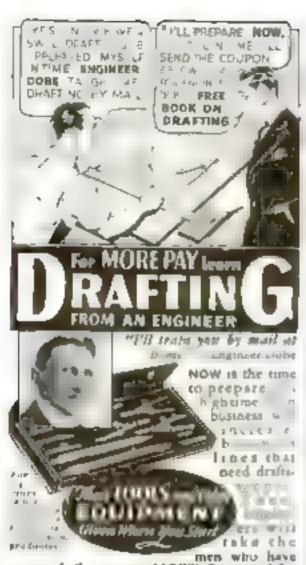
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#### 



#### EASEL AIDS IN RETOUCHING NEGATIVES





Left. The exact open to show brain angle arrips for and aggree switch. Right. With the regarder course to prove

AN EASEE, that enables amateur photographers to retouch nemicives can be easily from scrap materials. It is really nothing more than a support for the negative carrier of a standard autofocus entarger such as is used by thousands of camera enthusiasty. The base is a piece of any dense wood 1 by 16 by 6 in. To the long edges are mated 1-10, thick aprights, moved off at an angle of 45 deg, as shown. These pieces are 61% in long and high, their front edges overlapping the base a distance of 35 in

Str-inch lengths of 16-m, bram angle stock thin wooden strips will do just as well) are screwed parallel to, and about 1/2-in, below, the diagonal edges of the upoghta. The negative carrier rests so these supports, being held in place by the leaf spring it already has on one of its edges. It is prevented from slicing downward by two nails driven into the front edge of the hase. The sides of the casel are braced securely by a dowel stock materied about two thirds of the way up, in the back

For back illumination of the negative, a small, frosted 120-volt lamp with candelabra case is adequate. The lamp socket is held in place by an a shaped brass bracket. A finally with mounted in the right sidepiece is connected a series with the socket and a piece of flex old lamp cord with a plug on its end. These electrical parts, if purchased new cost about forty cents.

The negative to be retouched is placed on one of the pieces of place of the negative carrier and held by a mask of the proper size, against which the spring fingers press. It can then he worked on conveniently without showing finger marks, and the whole carner can be transferred to the enlarger for quick projection printing even before the retouching fluid has dried

Several easels like this are in use by members of a camera club and have proved lighly successful.—Rosser Herreses.

#### EASY WAY TO SALVAGE UNDEREXPOSED FILMS

Ween a negative has been so far under exposed that it will not make satisfactory points, it can be improved a bundred percent by dipping in a solution of endized pyrogallic acid. To make this, merely add twenty graits of pyro to a pent of water, and let it stand until the color becomes a dark brown. Leave the negative in this solution for five minutes, or until it is of an even yellow color; then wash und dry. The pentung exposure will be considerably increased when using a negative treated in this way—RAK.

#### Best Photos Among 3,000 in Contest

Ot R readers are making remarkable improvement in both the quality and quantity of the photographs they are taking. This was made evident by the entries in the contest announced in our ant November issue. Approximately 3,000 prints were submitted. The best of them were so beaut ful in subject matter and so technically per fect that the judges found it required long study to decide on the winners, all of whom turned in work of exceptional merit. The list is as follows:

FIRST PRIZE, 8.3 G A Baroden, Manchester, Mana

R R Oaker, Wankerka Whi

THIRD PRIZE 41 Hilliam Deppermann, Oronge, N. J.

FOURTH PRIZE ST. Haden Hankins, Rudmund Va.

FIFTH PRIZE 51
Augusta Strumpen, Philogelphia

P. 4 Amery Boyertown, Pa.

SEVENTH PRIZE. \$1 A T de Conp-Crank, Larreus. Francisco

EIGHTH PRIZE 51 C J Beiden, Pitchfork, Wvo.

HONORABLE MENTION—6 D Avidett Norlock, Vn S R Brunds, Hogers own, Md, R 4 Clark, Summet, N J, J A. Drevet, Elmkurst, N Y., E. Fernet, The Bronz, N Y, C. B. Flogge, Cincinnati, Okto; H I Guborne, Murouda, Mont.; R H Heiser, Washington, Pa.; A. T Mitchell, Camden, N J

The winners of the December Photo Contest will be announced next month.

\_\_\_\_\_

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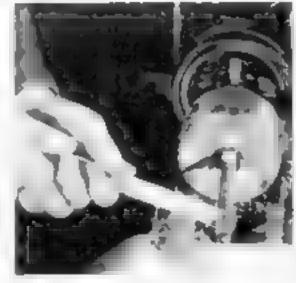
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#### SMOOTHING THREADS CUT IN COLD-ROLLED STOCK



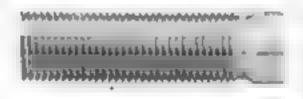
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VERY meets are known than difficult it is Experiment are not smooth the not read with on engine lathe in ordinary cold-rolled stock If the screw mu t be moved frequently to provide an admitment for a machine, the four hithread was some wear out the part of o which does It eas were be prend high pelish by a very ample method

Take at n precent with war so has white pine, about two fireads wise and press the end firmly a aimst the thread while the latter is rotating in the lather Let it follow the thread to the end R was this process till the r as ness of the send his worn full-depth after n like and of me was a

a art some from the thread and apsy than of entery product Again apply the ck waile the way is lattime. After the stick has run the length of the thread several t met, apply more emery powder and repeat in a surprisingly select time the toughnesses will have been smoothed away and the t read, af er a bath in sa date is terriore the Photographs between portage a farmal intend an cold-round stock before and after the lappang process.—Alekto P. Laxi





The first photo shows the thread as left by the tool, the second, after being smoothed

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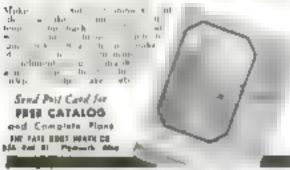




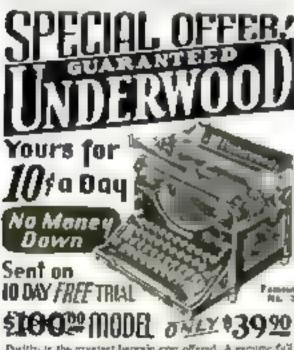
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# Veneer Press

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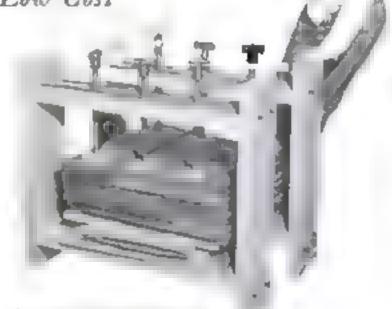
VENEERING is generally teconineed to be one of the most fascinating branches of woodworking, yet many amateurs hesitate to attempt it. That is partly because they think it very difficult and do not know exactly how it is done, but principally because they have no veneer press.

There are two good solutions to the veneer-press problem. One is to buy a special metal veneer press for panels a, to charten and consequent to use as I have only one server if it had to be purchased on the ordinary commercial basis, it would be an expensive piece of equip-

ment that it is distributed by a large plue company practically at cost in order to encentrace anatomy to do venegring. The site, is about 5.0

The other solution, for these who do not wish to make so lar c an art a investment is to sold a press like that illustrated, which was destened by Albert Constanting. In The hardware costs about \$6, and the lumber detection, usen he sourts and whether it is house in the rough or of and dresset to be case size in the rough or of and dresset to be case size in the rough or of and dresset to be case size in the rough or of and dresset to be case size in the trees has press in so inexpensive in because the screws are carpenter's steel the acreus, told by all sares hardware stores and general mail-order houses.

To construct the press, finals the four upradits accurately to size with all edges square and true, and cut dados (proovers with the almost accuracy so shown to receive the ends



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are used for operating the prosp

List of Materials

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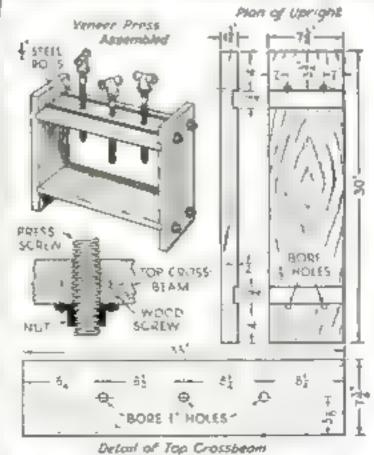
of the crossbeams. Here 3,-in, holes as indicated. Then prepare the tow-boarm with equal case and bore the three 1- a holes in each of the upper beams. On the underside of these two beams faster the large nats which come

with the vise screws. The two units of the prem may then be assemble and held by means of the west rady. These rate was wbeneath the lower beams and directly above the upper beams. Use steel washers on the ends of each red, and lighten the nuts with a worner.

In the, do not place the frames farther aport than 14 in. Lay a perfectly flut 1- or 1 value board across the lower members of the frame, place the veneered panel of other work on this, set another beavy board on top, and tighten the screws evenly Blocks of hard maple with a shallow 1 in hole in each may be used at shoes under the ewis of the screws, and, of coatse, if the work in the press is not high enough for the screws to reach it, any available wooden blocking may be used.

When songer pieces have to be vereired, an additional section can be built, although two sections are sufficient for most work an amateur is likely to undertake.

For complete instructions on vencering, refer to Herman Hjurth's book How to Make Vencered Panels for the School and Home Workshop.



Shortch of one of the assembled units, drawings of the oprights and crossbeams, and how the nats are fastened

### CHILDREN'S PANTOGRAPH FOR COPYING COMICS



Ama ch dren find t great fon to enlarge comics with this davice and then cover them

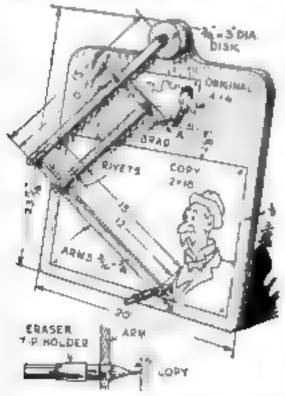
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If the holes in the arms are bured exactly as shown, the device will enlarge three times

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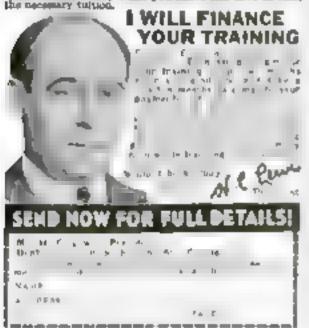
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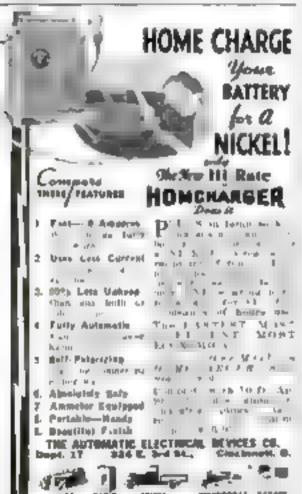
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#### ODD MACHINES PUT FUN IN MOVIES

(Continued from page 27)

plants large enough to yield the raw material for such imitations of hammers, chairs and other heavy objects used for playful socking on the comedy set. Lashter and more fracue than balsa wood yucca is being widely used in place of it at West Coast studios

After the sap has gone down, they cut the tall plants, which somet mes cam as much as twelve mehes in diameter in a single season. Then they same off the heavy bank and cut up the just no boards have chairs retail for about 5.50 upwere wine bottles for 5.5 h dozen, sicile hammers for \$1 and grant wreaches for y

BECALSE bottles, plates and other "break-away" objects made of wax "go mushy" on the sound track, thin plaster is being used anatead. It breaks with a realistic crash. Often, the side of such an imitation milk bettle is themser than a sheet of this paper. The necks of the bottles, where the actors grasp them. are made heavier to withstand the presoure. Painted plaster-of-Paris plates, looking exoctly like china, often weigh less than two

When we make rocks," one veteran propman told me, "we clean house, throwing in everything soft we have lying around."

The smaller tooks are formed of layers of newspaper covered with brown building paper and filled with ryretury and similar materials. The larger bowlders, such as roll down mountain seles to block the path of the villun, are likewise made of layers of paper First, stript of brown paper are glued around a rattan frame. When they are dry, the covering it cut open and removed from the frame Then it is glued together again and additional layers of paper are comented in place over it. A "two-ton" rock of the port could land squarely on your head without Injuring you, since it weighs only a couple of pounds.

When a comedian stumbles through a glass their he doesn't really enough it muse follow the glass sin't glass at all, but candy Thin, transporent theets of hardened sugar and water look exactly like glass on the studio set and are undely used. Because of the fragile character of most breakaway objects, the perspensivers turn out six times as many as accactually needed in a scene, to take care of accklental breakage

In one fricut comedy, the busiest laugh time from a trick shirt front. A pompous gentleman entered a room in full dress, unbuttoned his coal with a sweeping gesture, and his shirt bosom roued up like a window curtain! The prop man who made it sewed a coil spring from a clock at either side of the hirt bosom. Unbustoning the coat released the spring and permitted it to cold up again, rolling the short front with it

A jumping bean gag, which was the high point in another trei, depended upon the ingenuity of a proposaker for its success. In the medy, a blundering actor falls a pot by mistake with Mexican jumping beans and puts it m an oven. Later, when he tries to taste the beauts to see if they are done, they hop out of the ladle before he can get them to his mouth. The dipper was fitted with an interior spoon set on a spring. A wire, running down the handle and ending on a rine that fitted over the comic's little Sneer, enabled him to trip the release lever by a twitch of his finger, and send the beans flyttee.

O'NE mechanical device, supplied as a com-edy peop, worked too well for its own good. Several months ago, an eastern studio was filming a comedy about an eccentric inventor. He had devised a rucking chair with a motor attachment to do the nocking In the play he pulls the wrong lever and the chair

begins to hop around the porch like a hea on a hot plate. The chair, leaded down with rears, cams, and flywheels, appeared at the studio during the noon hour. By the time the camera was ready to shoot, the directors and actors had had so much fun riding the jumping chair that its machinery had broken down and it had to be sent back to the plant

Queer Inventions are always a fertile field for comedy gaps. Scores of them have aptwated on the screen in recent years. Of them all, the welrdest undoubtedly was the taxicab rigged up not long ago for a western produc-

WHEN the driver pulled one cord, a box-ing glove on a telephone extension volung but a indicate a real a or left then. A jerk in another and staned a fan revolving is trion of the radiator and this in turn set in motion a mechanical band which played a tune on a cornet to wars pedestrians. When a jaywalker was atruck, the bumper automatteally swung around, pivuting on one end, and swept the victim anto the gutter,

To start the contraption, the driver pulled a cord which opened a feed bux at the rear A mule, hitched behind, started forward to got the nots and propehed the taxi forward. With the animal never quite extening up with the onts, the ludlerous vehicle rolled down the

Another puzzler that took some figuring out, was a horse that scrattered its thin with its left hand hand. Western prop-men finally solved the problem with one of the largest puppers ever filmed. This bugs horse had twenty-one wires leading up into the rafters of the hig sound stage. Here "puppeteers" userated the wires that gave life to the imitatoon anima-

Not infrequently, sound plays a big role in making the comedy picture funny. In a film recently released, the comedian steals barefooted down a long hall carrying a sack of roofing made which he lovends to scatter in a rival a bedroom. As he tapties along, the naispour in a steady stream from a hole in the bag. Since the microphone rould not be held dose enough to the falling nails to record the sound at full strenath, a record was made later and dubbed in at the proper place. In making the record, a technician poured the nails act of meral concarner.

Lafelike dummies of papier-mache and other materials are often used to replace comedians us dangerous situations. Usually, they are photographed from a distance But, in one film at least, a dummy of this sort was shot at close range. In a train wreck, a dog rushes upto what appears to be its master and grabs a leg in an effort to pull him out. The leg stretches and stretches and stretches. Rubberized cloth permitted this indicrous anti-climat to a tense scene

Oftentimes, the dummes serve as "standins" for actors, taking their positions under the bot lights until the director is ready for action. Because of the effect of the heat and light upon real foods, rubber asparagus, plaster-of Paris fruit and papier-mache meats are turned out by proposakers to take the place of the genuine articles,

Virtually every comedy filmed these days depends for many of its laughs upon the skill and mechanical ability of prop men, Endless variety, rarely the same thing twice—that is the story of their work. The telephone rings, the mailman arrives; a telegraph messenger appears. And in comes an order that may be for anything from a twenty-foot mankey wheth to a danging sarding curious, aughcetting mechanisms that form the strumest product list on earth.

#### PEARLS MADE TO ORDER IN ABALONES

"C numed from page 25,

worth considerable money. "Rose bads" are very rough but their enquinte coloring and indescence place them among the most beautiful of pearls. It is possible for a clever jewelry designer to make fine pieces of art jewelry by using oddly shaped pours, "Libes," "leaves," and "petals" have been used in exquisite flower designs such as pansies and apple blossoms, until scarcity has made creation of these ornaments impossible. Such pieces with genuine pearls are now seldom seen but they are anatoted in carefully that pieces of shell Daisy petals were made by using arrowhead pearls selected for size and color Occasionally curious pearl formations occur. A Minecapolis jeweler owned a perfectly formed Madoona. Formacions in the scale of a tord are somet mes tound. "Acorn' pearls are not uncom-mon. A pearl dealer in Muscat.on, lows, has a perfect pearl top which will spin on a glass show case. Such peculiar pearls may be mounted into "exclusive" pieces of Jewelry by an artist with talent and improvious, and then command high prices.

UNTIL Bostwick created large pears in color, man had been unable to match nature in production of the surer pears, though Japanese pearl growers produced 600 pounds of true pearls each year.

Unill a few years agu, nearly all pearls came from traine and semitropic seas, most of them being brought up by divers in coastal waters off Asia from the Red Sea to Japan. Then Baron K. M is moto successfully produced per feetly formed pearls by selecting and cultivating pears system. His is considered one of the most important scientific developments of modern Japan.

Ruron Mikimoto plants the system in clear, clean water, whose temperature is above sixty-eight degrees Fahrenheit, on a clear builtom, over which the currents move sufficiently to bring fresh supplies of food. The pearl furnes usually are located where there are no octopi or startish, natural enemies of system. One of Mikimot is a new to be cated in the waters of southern Stema is southerstern Japan. There he operates as no a fifty-mile stretch of warm water.

In raising pearls, diving girls first collect young cystem, known as "spats," from the ses bottom. Sometimes even the floating survey are captured and the oysters raised. The spals then undergo an operation somewhat like those performed by Bostwick on abalones. in which the mantie parenthyma, a small sack, is removed. Into the sack a small bead of mother-of-pearl is placed. Then, the mouth tred, the sack is inserted into the shell-secreting epidermis of a second oyster. The oyster is then returned to the sea where in time it will cover the bead with several layers of nacre. The head-bearing system are suspended in cages from raits which are towed into proterted bays when storms blow up. Seven years later the pearls reach maturity, when they are harvested, cleaned, sorted and drilled for stringing

MINIMOTO plants seven million system each year One fifth of them die, usually as a result of the delicate operation, one fifth fall to produce pearls, three fifths yield pearls of varying values, totaling some 600 pounds to wright. Miximoto owns seventeen patents covering not only the culture but also the cages and a method for controlling the lester of the pearls. Experts consider these to be natural pearls—all products of one man on ten submarine farms totaling 41,000 acres is extent.

Contrasted with this high degree of productivity, only one shell in a thousand brought up by pearl divers contains a pearl. Pearl ishers usually operate in forty feet of water in two-man teams. The diver descends with a stone weight, falls his basket, and then signals to he partner who pulls up the stone the oysters, and finally the diver. Natives skilled in this hazardom work remain on the sea bottom from fifty to eighty seconds. One heat will take abouted as much as three tons of shelp a day during the four-months season. Four-year-old oysters are those most weight after

TWO milion people depend upon "natural" pearls for their fivelihood. Nearly a half milion trigage in pearl fishing. The largest feet has \$0.000 paired divers braving shark-infested waters of the pearl banks of the Bahress islands in the Persian guil, twenty miles off Al Hass on the Arabian coast.

These pearl fishers operate from high-decked dhown, at many as thurty-first divers going over the sides from a single chow. Each carnes a basket along from his neck. He dives us an oyster bed and rapidly places pearly after many to be able to the patter of the series of the state of the series o

But the divers seldom reap any of the rich rewards of pearling. In debt to the dhow owners, they are virtually slaves to their employers. The fortunes usually go to the merchants around the Person gulf, who produce from the folds of their often ragged carments but I pearls, some of which may go to the manner of No. North or Later for the piece of a big.

In the Dutch East Indies, adventurers from all countries seek pearls and pearl shell. Those with adequate capital go out up pearling luggers and employ East Indian divers to descend to the bottom. Daving is confined largely to the archipetago near Arm and Troember islands, though occasionally some adventurous diver descends into the toral bottom which lies at great depth. One pearl diver recently returned from such a trip with arms and legs paralyzed from the extreme pressure.

THOUGH a prart may lose "life", an expert can peel off outer discolored or dawed layers. In a few cases lustrous pearls have been restored in the manner, though they were somewhat smaller and few valuable than were the originals before they were dimmed by burief or accident

Genuine pearls can not be cut or polished tike other genus. It is a extrous fact that the beauty and value of a pearl increases if it is constantly worn in contact with the skin. The I ght moisture from a healthy skin, together with delicate friction from movements, lend to better the pearl and increase its luster There are in India professional pearl wearers who sit and move about in the sunshane while wearing strings of pearls to enhance their value. Most professional pearl buyers have what are called "pet pearls" which they rub grotly between the hands each day. When this is done regularly and properly, the luster is greatly improved and in some cases the value increases by one third to one half

In relation to other gens, the distinctive characteristics of a true pearl are its luster and its subdued izidescence. It does not flash and glitter like a diamond, but has modest beauty. A fine gem pearl is a criterioti of correctness and good taste and is worth, grain for grain, more than a diamond, ruby, or emersid. No new pearl fishery of consequence has been discovered during the last lifty years and fine pearls of size and quality are becoming so scarce that they are now in about the same class as Stractivarius violins.



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#### PLANES THAT GO STRAIGHT UP

(Continued from page 15)

come to earth without trashing in event of engine failure, such craft never will be undely used.

The suggestions for attaining this end have been many. They range from having a coltaxeable hadron, which can be mited from a tank of complex sea hy frogen in an emergency to folding window band wings that the paol cus open by means of a lever. Most inventors, at present, are working along the line of vari-able-pitch propellers. These lifting screws could be shifted from a positive to a slightly negative angle during the descent. Thus the wand would turn them like the blades of a windmill and check the drop. In addition, just before reaching the ground, the pilot could shift the blades back to their most effective litting angle and their momentum would produce an upward thrust that would slow the machine down before landing

AVARIATION of this scheme is proposed by a vising American inventor. He plant to have a gyroscope in the mach he to keep it level in the air. In a descent, the beavy wheel of the gyroscope would be spun by the whirling blades and when the variable-angle screws were shifted back to their lifting position, the gyroncope would give them added THE RESERVE OF THE PARTY OF THE

Of course, such proposals do not suswer the problem of engine failure close to the ground. They are applicable only during a considerable descent to become effective How ever, improvement in the landing gear, so it will absorb greater shocks, may take care of this problem. The experimental work with the autogico has accomplished much in this direction. The modern machine of this type can touch earth without damage when it is droppurg twelve feet a second. And, it is the shock of impact and not the full that does the damage

In the early nincteen-twenties, there was another burst of activity in the bessupers world. In 1921, the Marquis de Pescara, an Argentina of Italian descent, rode a twin propeller craft into the air at Barcelons. It was enulpped with a small body like a racing car, the engine and radiator being in front and the two screws, revolving at 200 revolutions a minute, overhead. Two years later, at lanyles-Mounneaux, France, he set a world's record with a flight of approximately half a mile On July 21 of that year, he achieved the first circle ever Sown with a helicopter

Denishen, in France, and Dr. George de Bothezat, in America, also made belicopter history. Ochmichen, in a machine with four lifting air strews and a number of auxiliary propellers, won a price of 90,000 france by flymg over a circular course of ocarly 4 tode

In America, the U. S. Army financed the experiments of De Bothezat. His giant apparatus, measuring sixty-five feet from tip to tip, was shaped like a buge Maltese cross. It had a six-bladed lifting screw, twenty-six and a half feet across, at each of the four outer points. The framework, formed by a mase of tubing and wire, brought the weight of the craft up to 3,400 pounds. Yet, when it was tested at McCook Field, Dayton, Ohio, the apparatus not only lifted its own weight but 1,000 pounds besides. Its balance in the air was so steady that in one flight it kifted three men hanging from three of the four points of the frame, A hundred times, it ascended from the field and landed again without accident The craft, on one occasion, was clocked at thirty miles an hour in a flight across the field.

Although De Bothezat's helicopter was one of the most successful tested, it flew only in perfect calms, and its provision for changing the nitch of the blades to provide for sofe descents in case of engine fashure was not tried.

The progress made in vertical flight during 1923 encouraged the British Air Ministry to offer a \$250,000 prize for a helicopter that could pass four tests. The winning craft must rise vertically to 2,000 feet and descend, landing without damage. It must climb to 2,000 feet, hover over a given area for half an hour, descend and land without damage. The third test was a flight at 2,000 feet over a twentymile course at a speed of sixty miles an hour For the final test, it had to descend from 500 feet with the engine dead and land in a circle of 100 foot radius.

All over the world, a weird array of "flying furtles," "thy windmills" and "agric." tuanels" were reported as being groomed to carry off the prize. But the time limit of the competition came and went without anyone for filling the requirements.

However, the Air Ministry has maintained its interest in developing a reachine capable of vertical fight. In 1925, Louis Brennan, noted English maval inventor, was subsidized by the government in experiments with an original design. The machine is reported to have lifted 1,000 pounds and to have hovered over one

spot for fifteen manutes

Four years later, in 1979, another machine the Isacco Hettrogyra, was built experimentally under the numbles of the Air M. nistry It had a single buge lifting screw with air-couled motors at each end aquipped with smaller propellers that pulled around the lifting blades. A somewhat similar idea is incorporated in the Curth-Bleecker helicopter, a \$250,000 experimental craft produced a couple of years ago in America. Each of its four lifting litades has a propeller in front to keep the aerial windmis-

Two other machines, one in Italy, the other in Belgium, have marked further advances

recently

With twin blastes issinning to opposite directions on a central mast, the D Ascanto helfcopier hovered and circled about ever an sir-field sear Rome for more than eight minutes, early in 1931 Lighter than must machines of the kind, it weighs only 1.750 pounds and has a ninety-five horsepower motor Smaller projectors at the after edges of the framework and in lines ing the traff and in maintaining balance

The Helidan craft, designed by a mechanic named Florian, is lifted by a pair of twest four foot screws, with a stubby nunitary propeller spinning between them. Its curious handing year consists of four shock-absorbing bumpers shaped like elephant hoofs. Rasing higher than the surround buildings, the machine hovered aloft for almost ten minutes

At the present time, a number of inventors are reported working upon the idea of combining a helicopter and a rocket. One plan is to have the lifting screws propelled by rockets, another, and more during one, is to have the craft shot upward to a desired beight as a projectile. Then, when forward momentum creams, vancs, folded into the side of the projectile, open out and, propelled by an internal motor, carry the machine along as a helicopter

In the murch for the goal of vertical flight, noblemen, mechanics, famous inventors, unknown tinkerers, and noted scientists all have grappled with the problem. They have spent millions of dollars and patents innumerable record their ideas. Yet, so far only tantalizing, partial success has been their reward

It is no wonder, then, that men al. over the world are awaiting eagerly the forthcoming trials of the English mathine

#### EXPERIMENTING WITH HOME CHEMICALS

Continued from page 571

the home chemist can wrap a cube in the cloth bag of the extraction apparatus and remove the lat by the carbon tetrachiorade method, in this case, the saft will be left behind in the bag.

By making use of a simple substance like totilde, you can even determine chemically whether fruit is ripe or unripe. An unripe banana, for instance, contains a large amount of starch, while in a ripe banana the starch has been transformed into sugar by the ripening process. Naturally, a drop of todine placed on a slice of unripe banana will form a dark blue spot as it reacts with the starch On ripe fruit, the discoloration will not be as great

WHEN put to its ordinary use in the kitchen, gelotin is simply dissolved in but water and allowed to cool in a storr time, it hardens into the transporent managed in salada and desserts. If it is bested over an extended period, however, the gelatin will not only fail to set or gel but will be broken down into its temponent parts

The effect of continued heating can be shown graphically in the home laboratory by making use of an interesting reflexing process. This consists of heating the solution in a round-bottom flask and allowing the distaled water vapor to pass up into a condenser. As it is condensed, it flows back and the flask and in reheated. In this way, the gel alin is kept at a temperature very close to the boding point of water throughout the heating process.

At intervals of soveral hours each some of the greater sociation should be removed from the flask and tested. After a certain period of heating it will be found that the greater no longer will southly and no amount of continued heating will cause it to get

Although a commercial condenser is shown in the shotographs alestrating this experiment a homerande unit improvised from corks, rubber tobing and olive bottes can be made by following the drawings

#### CHEMISTS MAKE WINE FROM CITROUS FRUITS

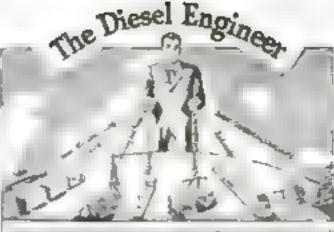
Service a way to use surplus crops of grapefruit, oranges and tangernes, government chemists have succeeded in making withes and compare favorably with the finest products made from grapes. The wines are prepared by reaming the finit, straining it and then fermenting it with a pure culture of wine yeast. Compaging is then added Citrous brandy also has been made by distilling the fermented juice Plans have been made to manufacture these new beverages commercially

#### COMPASS NEEDLE POINTS OUT HUGE IRON DEPOSIT

Solution of a sixty-year-old mystery in connection with the magnetism of the Earth has led to the discovery of what is believed to be the richest body of iron one in the world. Over a narrow strip of land, a hundred milestong, near the Russian town of Kursk, scientists who made a survey in 1874 discovered mystifying variations in the compass. The needle awang erratically first to the East, then to the West, and at times even to the South. Investigation disclosed the piant deposit

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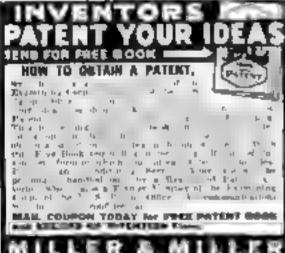
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#### CHEMISTRY MAKES SUGAR FROM BEETS

(Continued from page 30)

is not room, the diffusion will be equal in both directions.

The purce of the sugar beet is contained in tiny sais of fells, made of porous rellulose When they are immersed in water, the principie of osmosa because to mark. The june of each cet a diespoints to the strup in the sack which you tend to he end of the class tune in var experiment I'v beavier in detisity than the water out de Hence the water occurs to fittuse the duck the walls of the cet. There is c reservior expansion inside the cell, howor and onsequently, as the water enters, the suice is forced out. This process produces a much purer solution of sugar than the old pressure method, for many impurities are left behind in the beet cells. Very little sugar is left, however.

WHEN one of the big, from diffusors is the sugar factory has been fixed with beet noorlies, it is sealed and warm water is pumped sale it. A few annuies later the water is rained oil and pumpeo into the next detusor. which is also filled with noodles. From the go and different it goes to the Gard. Thus it tuntiques through the entire battery, dissolt ing more and more juice and increasing to retness as it gives. The whole process to quite alout first tive minutes to in the fine s. on a dibuser is based in h fresh needles. um. The moodles are exhausted of sugar and teady to be removed.

The juice-laden water as it emerges from the last diffusor is first measured, and then beared It is to a ready for hinning lever beet may factors as equipped with a huge letter he is that is nected and only or lame per-changes and all for the workers in a car for the sec. I cause o moved with water to em noth of ame, which is then added to the raw heet juice as it comes from the diffusors About three parts of milk of lime are added to 100 parts of juice

The action of the lime is to purely the junce Another simple experiment with enable you to ee for yourself just what takes place. Take a sugar beet (a carrot or pursup will serve just as well) and past it through a vegetable grater Then let the mass stand in a cup of warm water for ten or fil cen minutes, stirring it occasionally. The water, of course, will difhas use the plantice and the sugar will be moderal out of bein Other some manuer will be dissolved too, however-substances which must be removed from the solution before the sugar is removed.

Drain your solution into a beaker and hold it up to the light. You'll probably see many ist le species of vecetable fiber in il, but otherwise it will be clear. Note add several drops of milk of line. The whole solution will turn cloudy white. The lime combines chemically not with the squar, but with most of the other substances which are present in the solution forming strotoble current salts which will soon settle to the bottom of your beaker. To prove that the sugar is left in solution, fill another beaker with pure water and put a pinch of sugar in it. Now add several drops of milk of time as you did to your other solution. The sugar solution will remain periodly thear. Therefore you see that the time precupstates only the impurities in the raw beet runce as it issues from the diffusion battery The sugar stays in it.

WHEN the juice but been thoroughly hmed, it is treated with carbon dioude gas in what are called carbonatation tanks. This treatment dears the solution of excess time by precipitating it in the form of calcium

These precipitations serve a double purpose The first, which takes place when lime is added to the best juice, does away with most of the impurites which have been in solution. It does more however If you watched the precipitate settle in your beaker, you prohably saw that it curried down with it most of the specks of vegetable fiber and other particles that had been suspended in the solution when you first held it up to the light. The second precipitation, with the carbon dioxide gas, carries down stall more of them. Thus the juice is purified both thermically and mechanically

THE curbonatation of the junce must be A watched very carefully, for if it continues too long, serious damage may be done. An expert tester is constantly on duty beside the curbonalation tanks. Every few seconds be draws a sample of juice and holds it up to an electine lacts

He watches for the precipitate to gan," my guide told me, as he explained the process to the Brighton factory "Just wait here a counte, and you'll see it"

In less than a minute the tester drew of sample in which the white precipitate was swirling downward. Quickly he closed a valve, stopping the flow of curbon dioxide into the tank. The juice was now ready for the first

The Kelley press is simply a filter in which the price is forced through heavy canvas mats to remove the culcum precipitates. After the arst curbonatation and fattation, the juice in rathonstated and filtered a second time to further improve its parity. It is now a clear brownish solution of almost pure munr and evolumen. The next step is to bleach it so that the sugar produced will be white, instead of brown. This is done with sulphus dioxide gas. which is made to but ole up through the juice The gas combines with the water in the succe to fores sulphurous acid, which is one of the most powerful decolorisers known to present day chemistry

Tens sulphur treatment completes the first phase of operations in the manufacture of supar from sugar beets. The Juice has been extracted from the beets, purged of ampurities, and bleached. It is now ready to be rooked until the wagar crystallizes out of it. This is done in two separate operations. First the suice goes to the evaporators, where it is beated in various. Then, after another sulphur the mornt are amount of the property of modern Here the local and the factor of the bound are finished to the the

beet jusce has been reduced to a heavy mixture of molasses and crystal ne sugar. Now it goes to the centerfages, which are oig. however extenders, spanning the gland que, in the dat its per minute. Here the mouses is whirled through small perforations in the sides of the cylinders, while the sugar crystals are held inside. The sugar from the centrifuges is first dried, and then granulated in a huge drumthat slowly revolves, rolling and tumb) on the crestals until all lumps have been thoroughly despitezrated.

\*HE suckers use next in order Approximately 600,000 pounds of sugar are sacked at the Brighton factory every twenty-four hours. To produce that quantity, a most 2 -000 tota of beets are needed. One top of beets produces about 500 pounds of sugar-

You have heard much about the gold mines of Colorado. You have read about no strikes which changed poor prospectors into millionases, almost overnight. Yet the fortunes in precious metals, which have been taken from the mountains of Colorado, are small indeed when compared to the wealth taken annually from the soil in sugar beets. This state prodices more than one third of all the beet sugar made in the United States.

#### AIRPLANES HELP MINE GOLD ABOVE THE CLOUDS

Continued from page 23)

gather speed for the takeoff. The airport is two miles above sea level, and the rarefied atmosphere requires a two-portionately longer run and higher speed before we can pull back the controls and lift the seven-ton ship into the nar

Once up, we head for the crugs which form a snow-rovered rock barner, 15,000 feet buch, ying between Curro and the mute. A standard, two-way radio keeps us in touch with the ground. Meteorologists at Curco and Humacopamps report shifts in weather Mountain storms and treacherous winds among the peaks require constant viguance Beyond he now we this downward tato the I formed by the two ranges flanking Huanaconampa. Our wheels truch at a mile a minute in we skim down the central chalk han. We roll to a stop and taxa to the hotsting mechanism at the far end of the field Natives, sweating at the hand aranks of the w scher, host the load out of the plane and lower it to the ground, A few minutes later, we are off, south ag back to Cast .

Di RING the first tharteen days, we averaged four round trays a day. The heavilest and the ship over lifted over the backbone. I the Ander was a piece of machinery weighing more than 4 '00 pounds, or nearly two and a half tons. Twenty-sax mortar bases for the milling plant were hauled to the mine as a first step lin the work. They averaged about two time apaces. All told, we carried to the mountain top a complete milling, amalgament he and cyaniding plant capable of reating 150 time of ore every twenty-four hours. In addition, we detirered a hydrodectric plant capable of developing 750 house-power, and miscellaneous machinery, equipment and construction materials.

After the heaviest pieces had gone through, a second ship Joined the Sun Fernando in the work. It was the San Fetipe, also a tel metored passenger Ford with Wasp engines. As it was to carry only the smaller parts we book out the sexts and cubin fittings and council of the parts through the door. Two other pilots took turns at the controls. They were B. Rickarth and F. Sterling, crock Pon-American high-adviside flyers.

With both ships shutthing between Curco and the mine, work progressed rapidly By September 13th, we had unloaded 245 toss of machinery at Huanacopumps. The mine engineers were assembling the parts, and the huge rale of freight at the Curco milhead was die adding

the record for a single day's work with one ship was seven round rips and 25,500 pounds of much nery carried and animated at the plateau toposity. In forty five highes, we ransported 175,050 pounds of siret And by September 20th, we reached the half-way hold with 370 tops delivered.

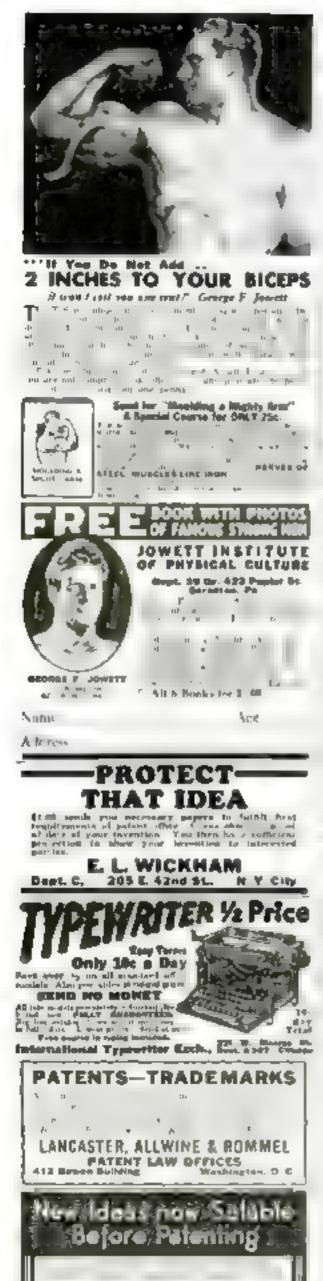
To the Indians of the Huanacopampa repion, our huge mechanical birds were a neverending source of winnier. They came from points as far away as Puno on the shores of Lake Tituaca, to see them

IN all, the metal ships made 459 flights and carried approximately 740 tons of heavy machinery by the middle of October we were cleaning up the odds and ends, And, on the last day of the month, the San Fernando and the San Felipe climbed into the sar on the 458th and the 459th flights. They had delivered, without a mishap, all the machinery needed for mining gold above the clouds.

It was three-thirty in the afternoon when the two planes sidesupped down on the Cuzro field. Dur work was over. We sent the home office at Lama the incomic ratio message.

"Last trip . . . Cargo finished."





#### MODERN WONDER CAMERAS SEE LIKE CATS IN DARK

Continued from page 41)

cellent partners of friends, parties, or even of the waiters in action. Incidentally, one of the beauties of a rul's-eye camera is that if makes it easy to get action pictures, the kind that are superior to all others in lasting to-

One of the first subjects that the owner of one of these remarkable cameras tackles is the mighttime street some 112-soon learns that brilliantly lighted theater signs and canones provide the best sources of light, and that wer or snow-covered sidewarks aid matenally in illuminating the subjects. Novel or attractive window displays offer worthwhile subjects. Interiors of busies, subscript. trolley cars, and trains are now as full of photographic possibilities as the sunfit street Dull days and stormy weather no lunger prevent the photographer from obtaining unu-ual pictuzes

THE so-called candid camera has proved valuable to news photographers and has Here's new melting president to an amaginers A candid camera is simply one that is small and speedy enough to permit pictures to be as a distribute of report is bout the and a knowledge A seasoned man walk a mit open, many bedeft and is a statte in the transference of the and mercanic The analysis aftern per the most sections, and herefore is more it fere, and ha ar a fruit may posed see p the

The horners of stealing" partures has been developed toto an art by news photograph ve and other candid cameramen. Somet mes tigenious faction are absolutely herewary, if the photographer would escape with an unthimseed ramess and a whole head. More han one news-picture man has come to grief a dog-race track operating in defiance of he law, or at some other place where photowith were not permitted, semply because he tried to get a picture with an orthoary ews camera that cannot be concealed much caster than a piano, On the other hand, many a notable picture scoop has been made with cot seeve camera. Such cameras can be conrealed in books, beneath coats, in packages, o law or do an ed to any of a thousand most was their where summittees a mera can be used in such a way that one was known picture is being made

The special cat level amera is not limited to might me purfere making I is equally the to it the distance or under any of ser condias after photographs normally can be e h Even in competition with standard cameras of larger size, it frequently comes out alread. Some minuture cameras can make pictures in such rapid succession that a series of shots showing the progress of an automobile mishap or other action can be obtained Finemenced operators are able to snap putures less than a second apart

N THE field of animal photography, highspeed minuture cameras are capable of unusual work, Bad light conditions, rapid movement, and a spoiled shot now and then mean nothing to the camera with a less ten turnes as rapid as the speed less of a few years ago, and using film that costs little more than a makel a foot or less than a cent

Photographers who go in for speed work and snapshots in poor light, frequently resort to tracks of the trade in order to boost the already great speed of their tilms. Hoper sense one the norm-we material by chemical though that he resorted to the first and consistance of battune the film at an aromonia solution for a short time, and then drying it as rapidly as possible. The speed increase obtained by such means is only temporary, an that the hypersensitized film must be used within a short time, usually a few hours, if maximum benefits are to be obtained.

Another method frequently used to increase film speed is pre-fogging. That is, the face is logged slightly by action of light before it is exposed in the usual way. An increase of the density of the silver negative image of three to five times a clasmed for this method. A convenient way to pre-log a flux is to set the camera shutter at a fairly high speed, any 1, 100 second, and the lens disphragm at a medium opening, about F/6 3; place a sheet of ordinary typewriter paper over the leas. holding it down about the edge of the lens flance, point the camera at the sky (not permilitary suntight to fall directly on the pa we over the lens), and anap the shutter. Reset the duriter, without moving the f.m. and make the exposure in the usual way. At night, pre-fogging can be accomplished with the aid of an electric lamp-

PROCESSING firms and making prints at one time presented a problem in cat ways , destography and other camera work too as ou very smal films. Today though there per thousands of animous non-empirers is so took took is of turning out element by four teen inch enumerments from negatives the size of one of the new Namenal Park postage

Manufacturers have concentrated on the making of fine-grain films, in which the micute particles of silver forming the photographic image have less tendency to clump together into grains than in ordinary fine-Lanous fine crain developers have dome thto use Amone them is a group employ no postaphetes care it tooms a chemical that useds the family ar preparations but which was discontinued because of its pomonous efects on the skin, and which is any enplayed widely in the rubber and many other HE ALICS

In addition to employing a Ane-grain firm and developer the cat s-eye cameraman has to be a bit fusey about the handling of the fitter If has to keep the temperature of the varous solutions and rime water constant the on bout, and then be careful not to chithe new when he attempts to dry it. He has t swab it negative with some noft material. south as one of the new Viscose snonger and remove scum and particles of that that he give look as large as polato bous in engagements After the film is safely dry must be handied caret in to avoid finger marks, stratches and dirt accumulation. Usuany, special enargen, designed to mamize aroun and accommodate small negatives, are employed for partning

THE cost of a good quality featest lens that is \*HE cost of a good quality cat's-eye campractical, may take your breach away, cope really since the outfit is not much larger than a pound of butter. Yet the abilities of that camera, coupled with its low-cost operation Erequently make it a profitable divesiment The photographer who seeks to make money from his hobby or profession can make such a camera pay for itself many times over Proof of this is seen to the fact that many free-lance photographers who sell pictures to magazines and newspapers, as well as professionals who specialize in baby pictures or other difficult branches of photography, are finding markets for miniature-minera pictures consistently. They produce good results in almost every field of photography. You will hear much about car's-eye cam

eres in the future, and see increasing numbers

of pictures made with them.

Chartered Institute of American Inventors h Bar a r But wing W tones in D 4

#### COIL-WINDING TRICKS FOR SET BUILDERS

(Continued from page 50)

Another method, and one which must be used when the spacing is wide, consists of marking just where each turn should go on the coll form and then applying the wire accordingly. By using either of the two wording kinks already described, the wire can be wound to the marks easily and will fall automatically into a well-formed spiral around

the form

Fiber cutl forms are not always used as the cores for coils. They may also be made to serve as containers for protection of the actone couls. In this case, the con, is wound on a hmus diameter tube and susped uside the regular form. This is a part controlly handy arrangement in portable sets where the coils are sure a receive hard use and if left exposed may be broken or mored. The outer form is then supplied with a handle which also serves DO H. COVER

VERY often, the amateur finds that alforms on hand they are not of the exact diameter specified for the jurticinar receiver he is huilding. Within certain mits, however be can alter the winding specifications to acree with the diameter of the forms he has available. If the difference is not more than twen ty-five or thirty percent, the number of turns a both tickler and grid warding will change inversely as the rain of the two tiameters while the change in he spacing between the two wordings was vary a receiv as the ratio for granted that wire of the size specified is unett.

For instance let us suppose that a cuil is specified as closes ag of a burty-live gold winding spared one quarter much from a fiveturn tickier on a form one and one balt inches in diameter and it is desired to wind the cost on a one- and me quarter inch form Applying he promotions, the tickler on the smaller cor will have so curve as my spitied by 1 , and the red by 1, the grid wind by will have there six tuens. On attipued by 1% and divided by 1 , and the spacing between colls will be returned to two ten he of an inch. is multiplied by I 4 and divided by 1/1).

Changing call spec-ficata as, however, a alwillys risky ousiness. As far as the beginner is concerned, it will be before to while he coils graft y as industed even though it may mean additional evenue. Plug-in colls are the heart of the sample toucherative short wave teteiver and unless they are accurately des goed and wound even an expert's wired circult will fan to give good results.

#### PIGEONS TO BE DRAFTED FOR THE NEXT BIG WAR

AN ARREST Of American froming pigeoms, a million strong, may be drafted in the event of war. Plans are reported to have been worked out dividing the country into zones with an ifficer to charge of each to keep in contact with all owners of pipeons, so that the birds can be mobilized in the shortest possi-ble time. During the World War, pigrons played an important part in carrying messages from one officers to beadquarters.

#### ONE FIFTH HORSEPOWER DRIVES MODEL AIRPLANE

Warst a tiny fuel tank holding one and a thurd ounces of gasoline, a six-foot model air plane takes off. flies, and sands, powered by a miniature motor developing one fifth of a horsepower. The model was designed and built by Paul Karnow an eighteen-year-old boy of Philadelphia, Pa.



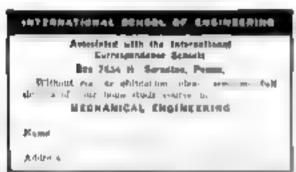


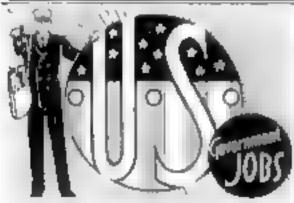
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#### HERE'S THE ANSWER

(Continued from page 61)

physical endurance, greater resistance to discase and a better defense accurat pervous and mental desorders than those who are under weight

#### What Is the Decibel?

J. A. L., WATERPUTE, CONST. A decided in one tenth of a "bet," the standard transmission and sound that named after Alexander Graham Bell, the inventor of the telephone. The bel does not indicate any specific quantity but is merely a convenient means for expressing a less or gain ratio for indicating the actual differences in power levels as in the changes in the volume of a sound.

#### Primary Prismatic Colors

W. J. B., at attacenta, s. o. Only three of the seven colors of the spectrum are consideted as being primary colors. These are red. erect. and blue. In pictnesses, however the three primary colors are red, yellow, and lane.

#### A Drop's Volume

Q 1) its how much input is contained in the average drop formed at the end of a medicine dropper b→V N. B., Jr. Portand. One

A run volume of the average drop can be considered at being equivalent to one twentests of a cubic continueter. Similarly one cubic centimeter equals about twenty drops

#### Columbus and the Elements

(i) F. T. or notes, and When Columbian descripted America only cleves of the recognition retention were known, eight of these oring metals. In fact, it was not until two him dred years later that the twestth—phosphorus

mas added to the list. The remaining eights of the ninety-two known elements were discovered during the past two hundred years.

#### Asks About Asteroids

T \ D., moson the 1 M. There are two chools of thought regarding the asteroids revolving about the sun in orbits adjacent to Mars and Jupiter. The first holds that they are the fragments of an exploited planet. The second contends that they are the makings of

planet that never formed. Up to the present about 1 100 asteroids have been discovered, the largest being about five hundred miles in diameter.

#### Fourteen Disenses Conquered

H. G. C., as writes, texts. Of the thirtytwo so-raised chief diseases, fourteen could be wiped out enterely if the existing medical knowledge concerning them was put used rigid use.

#### Removing Match Scratches

Q - car you give me a formula for a polish that will remove match scratches from formture? F. D. V. Oaktaod, Calif.

A seven seractive on woodwork error ally can be removed by rubbing them with a slice of lemon, following this with some powdered whiting, and finally with a scapy cloth.

#### Car Backfires On Hills

1 C, moorety w. w. One trouble that often causes a car to backfire when it is coast me down hall with the shrottle closed ran be traced to spark plug poons that are too close tentel has

#### WHEN YOUR MOTOR MISSES

Continued from page 62,

The first time it happened, he thought he d got some dirty gasoline, so he had the gas line cleaned, threw out three quarters of a tank of gas, and filled up with fresh. It looked like he had it licked until the garriang he came in here at the end of his neighbor a tow rope. He was fit to be used and blamed the gasoline again, but the joke was on him.

"What was the matter? Empty mas tank?"

"WORSE than that," thus chucked 'About two weeks ago, he lost his gas-tack cap, so he went to an auto-supply store and bought a fancy, makel-plated affair. He didn't know there were two kinds and bought one authorit a vent hole in it. Hav in a variation-tank cap he should have got one with a vent hole. Naturally, the vacuum fank couldn't such against the vacuum formed in the gas tank to it that dry In the city where he made short runs, the car generally was alle long enough between times for air to leak in around the threads and equality things, but on long trips, it was just too bad."

"What was the second jub?" asked Withers
That was a funny one, too. One of our
best customers took a long trip about a week
ago. Everything went fine unto his feed line
wasted to act up. Every hunared railes or so
it would not clouded and hard have to stop
and have it blown out. Dust was getting into
be gas time, in some way, but none of the
parages along the read could locale it.

When he got home on Tuesday, he came in here. I had a bunch, and took the tank off the chasts. As I was lifting it up on the bench I heard a pecutiar rattie, so I started fishing around launds the tank with a couple of long wires. It wasn't long before I pulled out three fret of rubber tubing

R boer tobing "

Sure. He probably had his car parked some place and a zasoline thief tried to sigher off the gas. Something scared bym, and in stead of pulling the tube out, he dropped it after that, it was just a question of time until the casoline started to attack the rubber and break it can into small power.

Are tas troubles the only times that can make a car sput or und to use a pshed Waltern Not by a long shot All some of lungs can be usen to make a med in mass, but some

can be open to make a moder mose but you, sometable can trace them by projectial when moses the mose the moses.

"If IT meses at high speed, but runs pretty amountily at low speed it's likely to mean that the breaker points are set too close matthe spark play points are too close together, that the high-speed mixture in the curburetur is wrong, or that the valve approx are weak

Lots of casa miss at low speed, but no fine at high speed," added Gas. "In the case, the spark plug points may be too far agast, the breaker points may be too widely spaced, the choke may be stuck, the manifold may leak, or the valves may be worn."

But what makes a car miss at all speeds?"

A whole mest of thines can cause that Poorty adjusted valves, stuck valves, dirt in the carboretor a plugged fuel line, seeks as the go turn winny burn stock dues, a tracked describes or head or rotor, or a poor carboretor maxture.

Just then, Joe Clark, Guss partner, poked his head through the door "Ned Hoffman just drove in, Gus," he called. "Wants you to take a look at his engine. Got a bad sputter, and throks maybe one of the spark pluss is fouled.

"What did I tell you?" grinned Gus.
"Number four and it's only Wednesday This
seems to be the week when the Model Gazage
in the port of missing motors."

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#### Elevators To Carry Fish Across Big Dam

(Continued from page 17)

continuous operation—while the water is lifting the fish that have entered one lock, other
solmon, guided by an outward flow of water
which they will swim against, can be entering
its compation lock. A movable cape, with a
slasted bottom, will lift the fish to the upper level when the injet pipe is opened, and
on arrival there give them a gentle impetus
to swim through the passage leading into the
channel above the dam. A single fish lock, for
emergency use, is placed at the south end of
the spillway trap. These will be the first locks
ever built for fish.

E ACH of the fish ladders, and each pair of locks, is capable of handling an entire day's run of sulmon as it arrives, or sections of the day's run can be diverted into the va-

rious fishways as desired.

Experiments now are being made to determine whether the young salmon will need help over the dom on their downstream journey to the sea. As the power home will use large, low-speed power wheels, it is thought that the young fish will be able to pass through without injury. However, surface bypasses will be provided in case the fingerlings are reluctant to allow themselves to be carried down either through the power wheels or under the spillway gates.

The design of the fishways over the Bonneville Dam to safeguard the Columbia River salmon is just one of the many ways in which the scientists of the Bureau of Fisheries are trying to better fisherman's luck, and to take a large proportion of the element of luck out of fishing—especially out of commercial fish-

inut.

Although even the sport of angling has an important economic aspect—it is estimated that, counting the cost of tackle, transportation, and so on, every game fish caught by a sportamen is worth a dollar a pound!—a bad day doesn't matter so much to the fellow who goes fishing for fun. But a bad season in the great commercial fisheries is an economic tracedy to a great many people. For, in one way or another, a half million Americans depend on our fisheries for their livelihood.

One of the important duties of the Bureau's scientists is to discover early signs of the depletion of species of fish that are of

commercial importance, and to recommend to commercial fishermen and to the states directly interested, measures to check the depletion. Another important duty
is to forerast for the benefit of
commercial fishermen the probable size of the coming season's
catch, so that preparations may
be made for handling and mazketing a large catch if one is likely, and so that money may be
saved in the fitting nut of fishing
vessels and the making of handling preparations if the season is
likely to be a poor one.

To enery out these duties, constant study of the fish his in large areas of the sea is necessary. The Bureau's seagoing scientists are the census takers of the deep. They aren't able to count every fish in the sea, of course, but by keeping close track of spawning conditions and of the total ratches of each variety of fish they are able to estimate closely how well the various populations are being maintained, and what the coming season's catch is likely to be.

Few salt-water fish "stay put."
From the beginning to the end
of their lives they keep moving from place to place. Even the

eggs of marine fish always are on the go. Deposited in the open sea, they are carried along by the currents, a part of the dense drifting life called "plankton" which is the chief basic food of most fish. After they batch, the young fish continue for a time to drift with the current, feeding on the plankton of which they lately were a part, and in turn preyed upon by larger fish. When they are strong enough to swim where they please, they start their endless migrations in search of food, and in obedience to the laws of their kind.

For several years, Bureau investigators have been tracing the drift of the eggs of haddock, weaklish, mackerel, and other important food fish, by means of experimental hauls with fine silk nets. A single cast of one of these small nets has been known to bring up

a half mutton weakfish eggs.

Valuable information about the growth and migrations of more mature fish is obtained by catching them, recording their measurements, tanging them with numbered tags, and retermine them to the water. A proportion of these tagged fish are caught at later dates—sometimes several years later—and, as requested on the tags, their measurements, with the date and place they were taught, are sent to the Bureau for thecking against its records.

Until recently all methods of tagging were more or less unsatisfactory. Metal tags clamped on a fish's tail were to heavy that they interfered with the fish's movements, and souner or later were through the fish's and fell off. Tattooing a number on the fish's side, and branding with dry ice, were tried, but neither method resulted in a marking that was permanent. Then Robert A. Neibit, associate aquatic biologist in charge of Atlantic investigations, solved the problem. He makes a small incision in the fish's body wall, inserts a brightly-colored tag of celluloid or soft rubber in the body cavity, and returns the fish to the water.

IN FISHERIES investigations it often is desirable to know the exact age of an individcal fish. Size gives a rough indication, but size is not always a true index to age, as adverse conditions essay keep a fish from growing as rapidly as the average of its kind. The scales are a much more trustworthy guide to its age. If you examine a fish scale under a microscope, or even under an ordinary magnifying class, you will notice numerous ridges, something like the growth rings in the section of a trunk of a tree. Ridges close together repcesent a period when the fish was growing slowly; ridges widely separated represent a period when it was growing rapidly. This makes it easy to determine a fish's age,

In 1932, the latest year for which full figures are available, the total catch of fish in the United States and Alaska was over two and one half billion pounds, and in spite of low prices it was sold for over \$54,500,000.

That our fisheries, after centuries of intensive fishing, can still produce this much wealth, is largely due to the conservation methods of our Bureau of Fisheries. In Alaska, where the Bureau has the power to regulate all fishing, the value of its work shows up most clearly.

THROUGH agreement with the Canadian government, the seriously depleted halibut fishery has been regulated so as to bring it steadily back toward normal. Another case in point is the fur-seal herd of the Pribilof Islands. When it came under the flureau's control in 1911 there were only 200,000 seals left after coany generations of ruthless staughter. Now the herd numbers 1,300,000, and is increasing at the rate of sight percent a year, although over 50,000 surplus males are being killed for their skins annually.

On the coasts and inland waters of the United States, where the Bureau has no regulatory power, conservation methods recommended by it have been adopted by many states and by many commercial fishermen. Especially effective has been the use of saving year by trawlers—large-mesh neis that allow fish below market size to escape.

The work of the federal fish hatcheries also is making for good fishing in the future. In 1943 these hatcheries produced and distributed over seven billion eggs, fry and fingerlings. Two percent of them were game fish, the cest food fish. Another important conservation measure was the rescue of fish stranded in shallow pools after the Mississippi floods.

One of the Bureau's many jobs is seeking new uses for fisheries products. Experiments

made recently in its technological laboratories show that awordfishiver oil contains from fifteen to twenty-five times as much vitamin A, and from seventy-five to 100 times as much vitamin D, as does standard cod-liver oil. This discovery probably will mean the expansion of the new comparatively small New England swordfish fishery until its product is worth about \$5,000,000 a year.

And the laboratory work of the Rureau's scientists does more than find new ways of putting dollars into fishermen's pockets. It finds ways of keeping their dollars in their pockets. In the past, not of every dollar that a fisherman was paid for his catch he had to spend twenty cents to replace his nets. Chemical net preservatives re-cently developed by the Bureau have made it possible for fishermen to save two million dollars a year on net replacements. Years of scientific study of the salmon have made it possible to regulate commercial fishing so as to produce the greatest possible catches for fathermen, while at the same time allowing enough fish to spawn to protect future runs in the various rivers.

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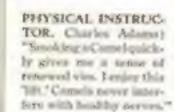
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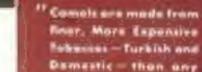
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